
**COLLEGE OF AGRICULTURE & RURAL TRANSFORMATION**

**DEPARTMENT OF AGRICULTURAL ECONOMICS**

# The Impact of Food security package loan on Food Insecure Households' Income and Asset Creation, The Case of West Belesa Woreda,North Gondar Zone, Ethiopia

MSc Thesis

By:

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# UNIVERSITY OF GONDAR

## COLLEGE OF AGRICULTURE & RURAL TRANSFORMATION

## DEPARTMENT OF AGRICULTURAL ECONOMICS

**The Impact of Food security package loan on Food Insecure Households' Income and Asset Creation,** The Case of West Belesa Woreda, North Gondar Zone, Ethiopa.

The Propensity Score Matching Estimator Model Approach**.**

A Thesis proposal Submitted to College of Agriculture & Rural Transformation Department of Agricultural Economics In partial Fulfillment of Requirement for the Degree of Master of Science in Agricultural Economics.

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## Statement of Author

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Date of Submission: February, 2017

# Dedication

This thesis is dedicated to

My Brother Zenebe Tesfay

My young sister Bisrat Tesfay

My Lovely Son Amaniel Welay

And

Leader who live for their peoples

# Biographical Sketch

The author was born in North Western Tigray Administrative Zone of the Tigray National Regional State in 1986. He attended his junior and high school education at Shire Senior Secondary High School (shire city). He then joined Awassa Agricultural College in October 2004 and graduated with BSc in Agricultural Resources, Economics and Management in 2007.

After his graduation, he worked in the Agricultural Development Bureau of the Amhara National Regional State, North Gondar Administrative Zone, Dabat district in the title of different positions as Expert of Extension Communication, Early warning expert and monitoring and Evaluation for non-governmental organization of Productive safety net Program from 2008 up to 2014. He then shifted to North Gondar Zone Agricultural and rural Development from July 2014 and worked as monitoring and Evaluation for non-governmental organization of Household asset Building and Livelihood program from July 2014 to 2015. Then he joined to University of Gondar on October, 3/2015 to learn MSc program in Agricultural Economics through extension program. During the MSc program and after the MSc class program he was worked up to now in the position of monitoring and Evaluation for non-governmental organization of Livelihood program

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## Agronomy

ACSI Amhara Credit and Saving Institution

CFI Chronic Food Insecure

CFSTF Community Food Security Task Force

CSA Central Statistics Agency

DA Development Agent

DS Direct Support

EEA Ethiopian Economic Association

EPRDF Ethiopian People Revolutionary Democratic Front

FSP Food Security Program

GC Gregorian calendar

GNI Gross National Income

GDP Gross Domestic Product

HABP Household Asset Building Program

HHs Household Heads

IRR Internal Rate of Return

MFI Micro Finance Institution

MOFED Ministry of Finance and Economic Development

KFSTS Keble Food security Task Force

NGO Non-Governmental organization

NPV Net Present Value

NPW Net Present Worth

OFSP Other Food Security Program

PIM Program Implementation Manual

PSM Propensity score matching

PS Propensity score

PW Public work

RUSACCO Rural saving and credit Association

WADO Woreda Agriculture Development Office

# ABSTRACT

*Food security Package loan has been found to be a critical instrument in order to improve the income of food insecure households. It is prominently used to improve the income of food insecure household borrowers where it is believed to be under exploited in research hence is indispensible to examine its real effectiveness. Therefore, the objective of this study was to analyze the impact of Food Security Package Loan of micro credit service on the livelihood of food insecure household credit users residing in West Belesa Woreda. For the purpose of analyzing the impact of Food security package Loan program's microcredit on the income of food insecure and Food secured households, a sample of 254 respondents that is, 157 clients who were food insecure and 97 food secure households has been taken. Data were collected through interview questionnaires that were prepared and distributed for both food insecure and food secure and interview was conducted and the questionnaires were filled out by the enumerators. The study was analyzed using Propensity score matching estimator model which is the best and currently widely used model to evaluate the impacts of policy intervention in an area by matching participants with non-participants and to estimate the impacts without bias. The result of the study displayed that food security package loan participation has a positive significant average effect on households' on farm and off farm income, employments, animal holding in TLU, saving and sending their children to formal education. However, the food consumption and types of house owned showed no difference. Thus, government authorities, NGOs, aid agencies and other stakeholders who are concerned with microfinance as a means to poverty reduction should take in to consideration the results of these indicator variables for better promotion of microfinance in general and food security package loan in particular.*



*Key words: Food security package loan, psm, logit, p-score*

# 1. Introduction

## 1.1 Background

The government of Ethiopia design agricultural led industrialization policy with the strategy of rural and agriculture centered development as a means of ensuring rapid economic growth, enhancing benefit to the people, eliminating the country's food aid dependency, promoting the development of market oriented economy. This policy and strategy integrated with the other policies and strategies of the country are expected to bring about rapid and sustained economy growth, guarantee maximum benefits to the majority of the population people, minimize dependency of foreign aid and promote the development of market oriented economy in Ethiopia (Food security manual, 2010)

The Ethiopian economy grows on average 0.5% from 1981 to 1991, 4.5 % from 1993 to 2004, and 10.9 from 2004 to 2014. The first gear shifts took place shortly after the political and economic transition of the 1991 with the down fall of Derge regime and the introduction of a more market oriented economy. The subsequently Ethiopian People Revolutionary Democratic Front (EPRDF) government turn implemented a series of structural economic reforms during the 1990s which paved the way for the second growth acceleration starting in 2004( MOFED, 2014 ). In addition to this the economy growth was remarkably rapid and stable over the past decade. Real GDP growth on average 10.9 in 2004- 2014 ( MoFED, 2014).

Most of the Ethiopian economy growth is depends up on the agriculture sector. It remains the largest employer having a share of around 80% of the total force accounts half of GDP and 88 % of exports (CSA, 2007). The sector holds the key to creation of demand in the other sector of the economy and remains by far an important indirect contributor to the country's GDP. The capacity of the economy to address poverty, food security and other socio-economy problems is highly depend on the performance of this sector (EEA, 2013). However the Ethiopian agriculture is depends up on weather condition due to rain fed agriculture. Due to this the production rate and productivity of the sector is insufficient to cover the consumption needs of the Ethiopian food insecure beneficiaries who live in the moisture stressed areas, according to Meseret (2012)

and Askal (2010) persistent poverty and poor chronic status are common manifestation. Furthermore according to Gilligan et.al (2009) chronic food insecurity remains the main features for Ethiopian rural poor.

As part and parcel of Food Security Program policy (FSP), starting from its inauguration in 2005, PSNP includes resettlement, complementary community investment and recently Household Asset Building Program (HABP). As the second phase, according to Julie van and Coll- Black (2010), in 2009, Ethiopia has re-launched the food security program where Other Food Security Program (OFSP) was replaced by Household Asset Building Program (HABP) where the later includes a demand driven extension, support component and improvements in access to financial services. Furthermore, Berhane *et al.* (2013) had purported that the second phase of PSNP is much better than the first phase in such a way that both chronically and transitory food insecure households are being ensuring food security. This due to expanding of micro credit services in the food insecurity woreda.

Proponents of micro credit claim that it helps poor people to reduce risk, raise productivity, obtain high retains on investment, increase income and improve the quality of their lives and that of their dependants (Robinson, 2001; Goldberg, 2005). It is further believed that micro credit can play a major role in assisting the poor to move out of poverty by providing start –up capital which they have been unable to access historically because financial markets are underdeveloped in poor economies (Getaneh, 2004). In Ethiopia, government and non-governmental organizations (NGOs) consider micro credits as a prime policy instrument in fighting poverty and increasing the productivity of the poor (Wolday, 2010).

However, there is so far no consensus among academics about the actual impact of micro credit on poverty reduction and household food security ( Segers et al., 2010; armendarize de Aghion and Mordurch, 2010) argue that, despite claims about the role of micro credit in lifting the poor out of poverty, there is little agreement as to whether credit does borrowers more good than harm. In addition to this some scholars oppose that poverty cannot be eradicated with small amount of money provided by micro finance institution rather it implicates the poor in the long debt cycle (Ghalib, 2007).

In recent micro credit literature, the differential impact of micro credit on different types of household has become a major discussion point and in Ethiopia context, very little is known about the role of micro credit in household food security and its impact on wider rural livelihoods (Segers et al., 2010).

The Household Assets Building Program (HABP) is one of the components of food security program which has been designed from 2010-2014 to provide micro credit through ACSI at subsidized interest rate to the food insecure beneficiaries to engage in different grave investment opportunities. In order to access micro credit the food insecure beneficiaries the program allocated 14 million birr for the district ACSI branch based on the total number of food insecure client who live in the woreda. The district ACSI branch gave micro credit services to the food insecure households based on the agreement between ACSI and the woreda agricultural office. The district branch has been addressed 2936 food insecure and food secured households and disbursed 16.02 million birr with average loan size of 4371.79 to 6777.14 birr minimum and maximum respectively (West Belesa agricultural office, 2016). Whether the food security program was achieved its objective or not through the micro credit in the study area, this thesis was conducted to analyzed the impact of microcredit on food insecure households' income change in West Belesa woreda.

## 1.2 Statement of the Problem

Credit, in development theory, is the main lubricant and a pioneering engine of economic growth and development. Winter-Nelson and Temu (2005) stated that Small-scale farmers in developing countries may become trapped in poverty by lack of the liquidity needed to make profitable investments. Increased access to credit could generate pro-poor economic growth if poor households are otherwise liquidity-constrained and if liquidity-constrained households benefit from the new financial services. They further asserted that expanded access to credit has been enthusiastically championed in the development community for its potential to generate sustainable economic growth that favors the poor.

Access to credit is considered as one of the key elements in addressing development issues in Ethiopia. Improving financial access helps Food insecure households to improve production and productivity through investment in irrigation, production equipment and inputs and in postharvest handling, processing and marketing (Amha and Peck, 2010; Amha, 2011). Similarly, a recent paper in Uganda by Khandker and Koolwal (2014) discussed that credit plays a crucial role in supporting agriculture by helping households in handling risk and purchase inputs/technology to improve their agricultural productivity.

However, to increase their production and productivity, most of the food insecure households have not been accessed micro credits on time due to different demographic and socio economics characteristics. Even few numbers of the food insecure households accessed to micro credit, the loan size is too small to enable the beneficiary to invest in feasible projects which can generate higher income (Ezgimeles T., 2011).

Household asset building program is one of the components of food security in Ethiopia that provides different integrated and holistic services to food insecure households in eight regions. West Belesa woreda is one of the 64 food insecure woreda in Amhara region. The woreda Agricultural office with integration district ACSI branch facilitated to food insecure households' to received micro credit. The food insecure HHs used the micro to start up their business based on the prepared business plan and to solve the bottleneck of initial capital. 16.02 million birr disbursed to 2,936 food insecure households with 10% and 15% interest rate to engage in

different on farm and off farm income generating activities and to diversify their income source and to move out of poverty.

But there is debate whether the available credit in the woreda has been in enhanced not only the food insecure households' income but also on their economy wellbeing. According to Abdul & Ismail (2010) the well-being or quality of life of people is as important for development as income. Graham (2005) found that people value aspects like health, stable employment, marriage as much as, if not more than, income. However it is not clear from the literature assessing the impact of microcredit on the food insecure households in North Gondar Zone whether this program is really efficient in changing the food security income due to accessing to credit or not.

The survey conducted by PlaNet (2008) half of the participants indicated a positive change in their quality and quantity of their food after receiving loans while only a few declared improvements in their children's level of education and health conditions. Moreover, in a sample of 100 women from Cairo, Nader (2008) found that microcredit loans were highly correlated with beneficiaries' children's education, income and assets, yet it had no effect in terms of enhancing their accessibility to better health services and having less quarrels or stressful events inside their families.

Credit helped the poor households' to engage on different economic activities like rearing and fattening cattle, shoats and petty trades. And due to participating on different income generating activities, 67.2 % of the credit holder clients have shown an increment on their income, and 29.5 % of borrowers and 21.2% of non borrowers showed in their house improvements, Bamlaku Alamerew (2006). The research concludes that credit has positive impact on credit borrower than non borrowers.

The case study conducted in 2010 in Ebinat woreda were investigatived that the credit financed to start their business plan diverted to consumption smoothing purpose and the credit affects the food insecure households negatively because they didn't able to repaid the credit on time and they were forced to sell their livestock to pay credit.

Even if there are so many researches were conducted to assess the impact of micro credit, almost all of the researchers focused only on the regular and fertilizer credit. That focused on one year

credits and on the production of crops where as this research focused on up to three years long term of package loan. In addition to this focused on regular credit that available to food secured households where as this focused on the food insecure households.

But the credits that available to the food insecure households for package purpose through ACSI were not studied yet. These credits whether change the income of the food insecure households' or not needs to be studied. That is way this Thesis was planned to conduct research whether the available credit has impact on the food insecure households' changing their annual income in West Belesa Woreda.

## 1.3 Objective of the Research

### 1.3.1 General Objective

The general objective of this study was to evaluate the impact of food security package loan on food insecure household changing their annual income and asset creation in West Belesa district.

### 1.3.2 Specific Objective

1. To analyze the impact of food security package loan on the food insecure households income and asset creation
2. To identify the timeliness of credit disbursement period and when credit was required by the food insecure households.
3. To analyze the most profitable of packages among different packages implemented by the food insecure households

## 1.4 Research Questions

1. What were the main impacts of food security package loan on the Food insecure households' income and asset creation?
2. Which type of business activities were the most profitable to food insecure households in terms of its investment cost?
3. When the credit demanded by the Food insecure HHS and actual when disbursed it?

## 1.5. Significance of the study

The research were study the impact of credit on food insecure households' changing of their income and diversifying their incomes in North Gondar zone, particularly in West Belesa woreda which is never conducted such research in this area. The research were answer the question, was the disbursed credit for the food insecure households' really increase and diversify their income sources or not? It also answers the debate between researchers, experts that credit has negative impact or positive impact on food insecure households' income. It was used as reference for other researcher who would be conducted a research with similar problems which doesn't cover this research. It would give some valuable policy implication comments and was used to solve the real problem of Chronic Food Insecure households in the district.

## 1.6. Scope and Limitation of the study

The study were analyzed the impact of credit on food insecure households' changing and diversifying of their income. It was used both quantities and qualitative data to investigate the real benefit of food insecure households from the available credit using the Propensity

score matching model. Hence this research was analyzed the impact of credit on food insecure households using the selected sample unit and were generalized the benefit of credit on the whole food insecure households. The research were analyzed the impact of food security package loan on changing of food insecure households' income. The research was also analyzed the impact of food security package loan that related to the income household like food consumption, non-food consumption, employment opportunity, types of house owned, sending their children to formal education and saving. Therefore the findings and interpretation of the study were depend on the sample size food insecure household only and it may be not 100% representative of the whole population due to disturbance error. More ever, the scope of the study were fixed geographically from the nine woredas to only one woreda i.e West Belesa Woreda due to financial , time shortage and none sponsor present to conduct the research in a wider way.

### 1.7 Organization of the Thesis

This Thesis proposal has been structured in to four successive chapters. Chapter one is combines the introduction, statement of the problem, objective of the study, research questions, significance of the study and scope and limitation of the study. Chapter two describes the literature review that was previously studied related to the impact of credit on food insecure households' income growth. Chapter three presents the materials and method of the research that includes the description of the study area, method of data collection, method of sampling, method of data analysis and model specification. Chapter four captures the result and discussion part of the research.

## 2. Literature Review

### 2.1 The Definitions and concepts of credit

According to the free on line dictionary, Encyclopedia (undated), credit means Faith and it comes from the Latin credito. An agreement, by which something of value-goods, services, or money-is given in exchange for a promise to pay at a later date. Credit is a transaction between two parties in which one, acting as creditor or lender, supplies the other, the debtor or borrower,

with money, goods, services, or securities in return for the promise of future payment. As a financial transaction, credit is the purchase of the present use of money with the promise to pay in the future according to a pre-arranged schedule and at a specified cost defined by the interest rate.

It was also defined by Ellis (1992) that credit is a sum of money in favor of the person to who control over it is transferred, and who undertakes to pay it back. Moreover, Beckman and Forster (1969), defined credit as the power or ability to obtain goods or services in exchange for a promise to pay later. Similarly, it is a power or ability to obtain money by the borrowing process, in return for a promise to repay the obligation in the future.

## 2.2 The concept of microfinance and microcredit program

Microfinance/microcredit program are based on the theory of utilizing social capital to fuel development from below; as a result these programs have emerged as a favored model of development (Rankin, 2002, p.9). Microfinance is a phenomenon that reflects the provision of credit and microloans to low income people in order to enable them to engage in productive economic activities that help them enhance their income (Awojobi & Bein, 2011). Microfinance is a wider concept than microcredit as it includes the provision of other financial services like saving funds and insurance services in addition to the provision of microcredit; however the two terms (microfinance and microcredit) are often used interchangeably (Khandker, 1998).

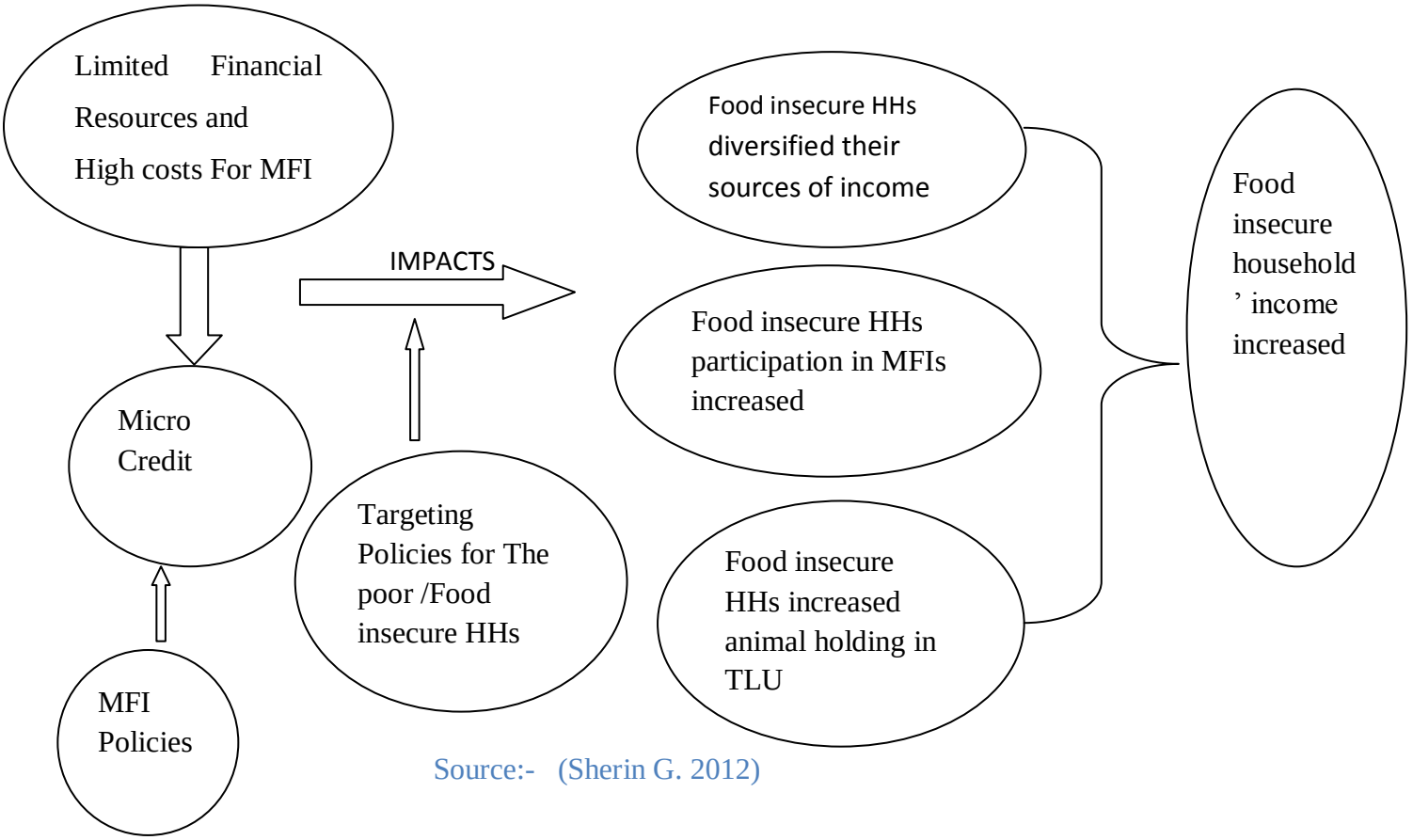
## 2.3 Theoretical Concept of Micro credit

According to the theory of microcredit, the poor can be lifted up if they have access to micro loans that enable them establish small business to finance their living. As presented in the theoretical framework in figure 2.1, below shows microcredit impacts on the loan holders can be captured on three different levels;

- The food insecure households of the loan holder household diversified their sources of income through participation of on different income generating activities.
- The food insecure households of the loan holder household have increased their Animal Holding in TLU due to allocation of credit for livestock purchasing.

- The food insecure households of the loan holder household have increased their Participation in micro finance institution when they borrow, repaid their credit and saved part of their income earned.

**FIG 1 Theoretical frame work**




Source:- (Sherin G. 2012)

## 2.4 Microcredit and poverty reduction

The literature contains of number of definitions of poverty, starting with the lack of main resources to meet the basic needs to sustain life; to lacking access to main services and rights. As stated in Smith (1776, p.21) "every man is rich or poor according to the degree he can afford to enjoy the necessaries, convenience and amusement of human life". It is the perception of poverty that really differs when defining what is really meant by poverty. As referred by Fasoranti (2010) perception differs according to the present experience of the individuals, conditions of the surrounding environment, their vocation, education and their definition of a good life. Hence

"poverty has become a general phenomenon that is perceived to mean different things to different people at different times and places" (Fasoranti, 2010, p. 1439).

There are two conceptualizations for poverty; the traditional and the monetary concept. The former refers to the ability of the individual to meet the basics needs of food and consumption. The latter refers to the materialistic boundaries to include other aspects starting from education, health, shelter, nutrition, till enjoying security and rights like freedom of speech (Haughton & Khandker, 2009). In general poverty can be defined as the "pronounced deprivation in wellbeing." (World Bank, 2000, chap. 1), where wellbeing here embraces not only material capabilities as measured by income and consumption levels but immaterial as well measured by the level of education, health, children nutrition and rights. It is even broadened to include vulnerability and exposure to risk, noiselessness and powerlessness. Accordingly poverty is a multidimensional phenomenon that cannot be defined by just enhancing the income of the poor or increasing their levels of consumption rather it requires an integrated strategy to enable the poor to acquire the capabilities needed to enhance their wellbeing in general. Microfinance/microcredit programs are considered one of the effective tools that can enable the poor to not only enhance their income but their household overall well being as well.

## 2.5 The Concepts of Micro Finance and microcredit programs

Microfinance/microcredit program are based on the theory of utilizing social capital to fuel development from below; as a result these programs have emerged as a favored model of development (Rankin, 2002, p.9). Microfinance is a phenomenon that reflects the provision of credit and microloans to low income people in order to enable them to engage in productive economic activities that help them enhance their income (Awojobi & Bein, 2011). Microfinance is a wider concept than microcredit as it includes the provision of other financial services like saving funds and insurance services in addition to the provision of microcredit; however the two terms (microfinance and microcredit) are often used interchangeably (Khandker, 1998).

There are many definitions of microcredit. Generally the main idea behind it is to enable poor people to have access to financial services that they cannot attain through regular banks since they lack the collateral required in such a case. According to Schreiner & Colombet (2001, p. 339) it is an "attempt to improve access to small deposits and small loans for poor households neglected by banks". It also includes "the mobilization of savings and disbursement of micro-credit to the economically active poor, so as to provide employment and means of sustainability to improve the living standard in an economy" (Awojobi & Bein, 2011, p. 160). In general the main purposes behind microcredit program are to "extend small loans to poor people for self-employment projects that generate income, allowing them to care for themselves and their families. In most cases, microcredit programs offer a combination of services and resources to their clients in addition to credit for self-employment. These often include savings facilities, training, networking, and peer support." (The Microcredit Summit Campaign, 2009) Microcredit entails not only providing the poor with financial services but with the added capabilities needed to set up their self employment business projects and maintain their sources of sustainable livelihoods instead of waiting for employment opportunities from the government (Fasoranti, 2010).

Microcredit are given to the poor either to help them establish their new business projects or to help small entrepreneurs who already have their business to expand it and be more sustainable (Johnson & Rogaly, 1997). Usually the duration of these kinds of loans are short-term, maximum two years, conditioned to be used in productive projects for example agriculture, industry, trading and not in consumption. Typically the interest rates are higher compared to traditional bank loans (Jaffer, 1999).

Whilst microfinance institutions are not banks and should aim to serve people that do not have access to traditional banks, they still operate like traditional banks in that they are interested in making a profit. Hence microfinance institutions are two-faced in nature: "social nature and a for-profit nature" (Gutiérrez-Nieto et al., 2007, p. 131). There are different kinds of microcredit program; however in general microfinance institutions offer credit either through joint liability group lending or individual-based lending. The individual lending model is close to the banks model where there is a direct relationship between the program and the loan holder, whereas the

group lending model a group of borrowers are responsible for loan repayments. In this case if one of the group members does not repay the loan the others group members have to contribute otherwise the whole group will be deprived future access to loans from the program (Hermes & Lensink, 2007).

There are different forms of microfinance institutions. A survey in developing countries by Lapenu & Zeller (2002), classified micro finance institutions as either: NGOs, cooperatives, registered banking institutions, government organizations, or projects. The research results showed that banks are the best in terms of staff productivity but are the worst in terms of outreaching to the poor especially women. NGOS are the best in outreaching but have low productivity. On the other hand government institutions are low in both staff productivity and outreach. However microfinance institutions performance is not in the scope of this research rather it's the efficiency of these programs in alleviating poverty and enhancing the wellbeing of the poor.

### 2.6 The impacts of microcredit programs on alleviating poverty

The impact of microcredit program on reducing poverty and enhancing social well-being of the poor has been widely investigated. Reviewing the literature investigating the microfinance impact on poverty alleviation shows disparities between supporters and opponents. In summary one can identify three main positions in the microfinance literature: those that argue for the positive impact of microcredit on the poor; those that argue for the negative impact of microcredit on the poor; and the third position lies somewhere in between where there is a positive impact yet not for the poorest.

According to the first position microcredit programs have a positive impact not merely on the poor household income and consumption level but on their social wellbeing as well, reflected by the impact of these program on recipients' level of education, health and children nutrition. Furthermore it extends to women feelings of empowerment and independence. The positive impacts of microcredit on income and consumption levels have been well documented. For example, in his study on participants of Grameen Bank in Bangladesh, Hossain (1988) found significant impacts of the effect of microcredit program on alleviating poverty in Bangladesh.

This was reflected in higher income, capital accumulation and employment among loan recipients. Similarly Khandker (1998) found that 5% of the loan recipients' households in Bangladesh were able to get out of poverty due to the loans from microcredit institutions.

In both studies there were spill-over effects where the overall employment rate and wages rate were enhanced in the whole village in which the microcredit programs operated. Additionally the significant effects for the program were found to be greater when the recipient was a woman (Pitt & Khandker, 1998). Other research in Bangladesh by Mustafa (1996) found that microcredit program enabled the recipients to enhance their material wellbeing reflected in indicators such as wealth, revenue earning assets, value of house structure, the level of cash earned, per capita expenditure on food, total household expenditure. While Zaman (1999) found microcredit program to enhance recipients' ability to build assets and reduce their vulnerability by enabling them smooth their consumption through balancing between their savings and spending during different phases of their life, hence become less vulnerable to income shocks. The results showed that in general women's participants are relatively more efficient than men in promoting the well-being of the households. As verified in Pitt et al (2003), women usually invest in their children's health and enhance their nutritional status.

Positive impacts of microcredit have also been found by Kaboski & Townsend (2005) who evaluated the impacts of microfinance institutions in rural Thailand. They found it to enhance asset growth, consumption smoothing and occupational mobility, while decreasing borrowers' vulnerability, also especially if women are the main recipients. In another study Kaboski & Townsend (2009) found that income, consumption and agricultural investment increased among recipients as well as overall wages levels in a village in Thailand. In Mexico Bruhn & Love (2009) found positive impacts of opening a new microcredit institution branch on business ownership, income and employment.

On the other side of the argument Adams & Pischke (1992) found microcredit to be ineffective on the poor income and overall well-being status. The researchers argued that lacking financial services is not the most pressing problems faced by the poor; and further argued that their problems will not be solved by going into further debt. The cost of providing these financial

services was also very high compared to the benefits received by recipients especially in poor countries. This was further emphasized by Buckley (1997) in his research on micro entrepreneurs in the informal sector in Kenya, Malawi and Ghana. He found that these form of "capital injections" offers the "illusion" of fixing the profound problems of these people which rather need more structural changes in the socioeconomic conditions that defines their activities. Utilizing case studies from Sri-Lanka and Bangladesh, Montgomery (1996) showed the disadvantages of group lending schemes. He argued that there is incompatibility between meeting the poor needs and extending the credit. These programs give more pressure to the recipients and resulted in added social costs.

In Bangladesh, Morduch (1998) used a cross sectional survey of 180 respondents from participants and nonparticipants in micro credit program. He found no evidence indicating higher consumption levels or educational enrolments for children of loan holders, but merely a reduction in consumption variability across the seasons for the participants. Accordingly microcredit program were not found to enable households to increase their consumption level but simply offered them "ways to smooth their consumption through smoothing income". This benefit he found negligible compared to the program costs. In his work Mordouh (1998) argued that the estimation techniques used by both Khandker (1998) and Pitt & Khandker (1998) overestimated the significant positive impact of microcredit program. Pitt et al (1999) in turn questioned the estimation technique used by Mordouh (1998) accusing it of underestimating the program impacts, yet Roodman & Morduch (2009) in their research replied to this study and questioned the validity of the results in term of the econometric techniques used in the research. Using a randomized experiment analyzing about 5,000 households in rural Morocco who received loans of $125 to $1,850 for two years period, Dufflo, Esther (in Straus, 2010) found insignificant results on these households consumption, social well-being and women empowerment .

In the middle of the road some researchers see the benefits of such institutions but also identify the relative pitfalls. For example, Hulme and Mosley (1996) in their survey research in Bangladesh, India, Sri-Lanka and Indonesia found that more affluent recipients benefited more from the microcredit program than the poor, hence doubting the efficiency of microcredit

program as a poverty alleviation tool. This is further emphasized by Mosley (2001) in his research study in Bolivia. He found that although these credits reduced poverty and increased participants' income and assets it did not reduce extreme poverty. Furthermore in his note, Hulme (2000) indicated that effective microfinance institutions only provide services for the poor but not for the poorest and "the poorest of the poor". Hulme supported Pischke (1992) in his naming for microcredit as "micro debt" since not all microcredit programs were found to produce favorable results especially for the very poor working in low returns activities and vulnerable to environmental and economic shocks.

## 2.7 Empirical Literature in Ethiopia

The research conducted by Guush Berhane (2011) in Ethioipia, examined that the food insecure households who participated in the micro credit increased their food security by 1.38 months, accumulated more animal holding 1.001 in TLU, accumulated 133.6 birr in farm tools than the non-participants of in the micro credits. Moreover the participants produced 147 kg grains and obtained higher yield 297 kg/ha than the non-participants. Welderufael (2014), carried out a study of determinants of household vulnerability to food insecurity in Ethiopia, results show that those households with large family sizes, lower consumption expenditure, old age, unemployed and male headed households were more food insecure in urban areas. Farm inputs, farm size, shocks such as drought and illness were the determinants of rural household vulnerability to food insecurity.

Siyuum (2011) examined the effect of access to microcredit by food insecure households in Ebnat Woreda, Ethiopia. A total of 106 respondents comprising; 55 microcredit clients and 51 non clients participated in this study. Ethnographic field work was used to interview respondents in both groups. Findings showed that, instead of assisting poor households to move out poverty and food security credit has pushed most of them further into indebtedness.

The research conducted in Mekelle sub-city, the impact of micro credit on livelihood of borrowers showed that participation in micro credit have had significant impacts on the livelihood indicator variables such as average monthly income, consumption expenditure, saving

of borrowers, expenditure on housing improvements and investment of human capital, particularly expenditure on children education and medical care of borrower households. Moreover significance impacts of micro credit services on household income and expenditure shows more positive signals of importance which can be geared towards improving self employment opportunities. Furthermore the saving increases along with the period of attachment of the clients to financial institution. This trend of saving behavior should continue so that clients would able to expand their business Diro Bekel and Regasa Dereje (2014). The results of binary logit model highlighted that out of many variables included in the model gender of household head, age of household head, numbers of dependent on the household member and spouse status of household head were found significance factors determining micro credit participation as cited Diro Bekel and Regasa Dereje (2014).

## 2.8 The Cost Benefit Analysis

Cost – benefit analysis (CBA) is a tool used to determine the worth of a project or investment. CBA principles and practices are well established as evidenced by the vast amount of literature available from academics, CBA practitioners and governmental agencies. CBA is quantifying analytical tool to aid decision makers in efficient allocation of resources. It identifies and attempts to quantify the cost and benefits of an investment or activity and converts available data in to manageable information. The strength of the method is that it provides a frame work for analysis data in a logical and consistent way.

A CBA adds rig our to a program evaluation because, among other things it make explicit the links between the inputs and outcomes. Clarifies under the lining assumption and points to gaps in information. By endeavoring to express outcomes (benefits) and inputs (costs) in currency local currency (Ethiopian birr) terms. It facilitates comparisons across different types of investments as well as options with in a particular project. it combined all costs incurred in the project like costs of physical production inputs, labor, land, Taxes and Debt service, interest on capital cost of finance, cost an economics and the tangible and intangible benefits of projects like increase production, improved quality, time and location of scale, processed product, reduced cost (transport mechanized) and reduced loss and new jobs created by the projects.

There are decision criteria with which benefits and costs can be compared. These can be classified broadly as restricted methods or more comprehensive methods.

**2.8.1 Restricted methods**: - these criteria include the payback period methods, the peak profit method and the average profit method. All there are very simple and restrictive because economic efficiency is not the main consideration. As a result, these limited methods may produce misleading result. The use of these methods is not recommended; therefore they were not used in this study.

**2.8.2 Discounted measures of project value** a number of measures exists to measures the discounted project worth. The three commonly used measures are net present value (NPV), internal rate of return (IRR) and benefit cost ratio.

- Net present worth (NPW) also known as net present value (NPV). The NPW of a project is the sum total of discounted INB:

$$NPW = \sum_{i=0}^{n} \frac{Bi-Ci}{(1+r)n} \quad --- \quad or \quad \sum_{i=0}^{n} \frac{INBi}{(1+r)n} \quad ----- \quad 1$$

Where r= discount rate

n= number of years

I = year

B = benefit

C = cost

NPW= Net present worth

- Internal rate of return (IRR) – the IRR is the discount rate where the present worth of costs is equal to net present worth of benefits. i.e the NPW equals zero . IRR is r where

$$\text{IRR} = \sum_{i=0}^{n} \frac{\text{INB}}{(1+r)n} = 0 \quad ----- \quad 2$$

The IRR is calculated iteratively, manually, or by computer.

- Benefit /cost ratio (B/C) - the B/C is determined by dividing discount benefits by discounted costs.

$$\frac{B}{C}\ ratio = \frac{\sum_{i=0}^{n} \frac{Bi}{(1+r)n}}{\sum_{i=0}^{n} \frac{Ci}{(1+r)n}} \quad ------ \quad 3$$

### 2.8.3 Application of measures

These measures are used singly or combination. The NPW is an absolute measure, and is more appropriate measure for similar projects and/or cost outlays. It funds are limiting; this measure is useful for comparing mutually exclusive projects. The IRR a popular measures and a project is considered viable where the IRR is greater the interest rate in the financial analysis and greater than the social time performance rate in economic analysis.

The B/C ratio, like IRR is a relative measures the greater the ratio the more viable the projects.

The solution and ranking principles for investment analysis

Table 2.1 selection and ranking principles for investment analysis

| Approach | Selection principle | Ranking principle |
|---|---|---|
| Internal rate of return | Selecting the investment if and only if the internal rate of return exceeds the cost of raising investment funds. | Rank all investment in order of decreasing internal rate of return. |
| Net present value | Select the investment if and only if NPV is present | If investment is substantially the same size, rank in order of decreasing NPV. |
| Benefit-cost ratio | Select only if the ratio is greater than one | Rank all investment in order of decreasing benefit cost ratio |

Any lower cut- offs than those given here as selection principles would result in the research agency making a loss (though not always on the sane basis). A more stringent selection principle , under any of the approaches , might be to take the highest ranked group of project that exhausts a fixed research budget ( Rooney et al, 2004).

## 2.9 Impact Evaluation approaches

There are two main approaches in impact evaluation. These are randomized (experimental) designs and quasi-experimental (non-randomized) designs (Baker, 2000).

### 2.9.1 Experimental (randomized) methods:

Experim0ental (randomization) method is an approach in which both participants and non participants of a program are randomly selected before the implementation of the program. That is, by randomly allocating the intervention among eligible beneficiaries, the assignment process itself creates comparable treatment and control groups that are statistically equivalent to one another, given appropriate sample sizes (Baker, 2000). This method ensures that a mean difference in conditions of the treatment and the control groups after the intervention can be attributed to the intervention (Ezemenari *et al*., 1999).

The experimental method has both advantages and limitations. The main advantage of this method is its capability of removing selection bias, which arises when participation in the program by individuals is related to their unobservable or unmeasured characteristics, which in turn determine the program outcome and its simplicity in interpreting results. However, it has at least six problems. First, it may be unethical to randomly assign eligible members as a control group and exclude them from benefits or services for the purposes of the study. Second, it can be difficult to provide benefits to one group and exclude another politically. Third, it is difficult to obtain control groups for programs implemented in large scale that involve all groups. Fourth, individuals in control groups may change certain identifying characteristics during the experiment that could invalidate or contaminate the results. Fifth, it may be difficult to ensure that assignment is truly random. Finally according to (Baker, 2000) experimental designs are not time and cost effective, especially in the collection of new data.

### 2.9.2. Quasi-experimental (non-experimental) method:

Non-experimental method is applied if a program placement is deliberately located. Non-experimental method is a single cross-sectional survey done after the program is implemented (Jalan and Ravallion, 2003). According to Bryson *et al*. (2002) non-experimental method is divided into two as: before and after estimator and cross-sectional estimator. The essential idea of the before and after approach is to compare the outcome of interest variable for a group of individuals after participating in a program with outcome of the same variable for the same group or a broadly equivalent group before participating in the program and to analyze the difference between the two outcomes as the estimate of mean treatment effect on the participants whereas the cross-sectional estimator employs non-participants (control groups)

to derive the counterfactual for participants in which case it becomes quasi-experimental method.

Quasi-experimental design involves matching treatment groups with a comparable control group of individuals who did not participate in the program. This approach simulates randomization but need not take place prior to the intervention (Kerr *et al*., 2000). Quasi-experimental methods can be used when constructing treatment and control groups though experimental design is not possible. A quasi-experimental method is the only alternative in two cases; in the absence of baseline data and when randomizations are not feasible options (Jalan and Ravallion, 2003).

Since the treatment and comparison groups are usually selected after the intervention by using non random methods, it is necessary to apply statistical controls to address differences between the treatment and comparison groups. In addition, sophisticated matching techniques should be used to construct a comparison group that is more or less similar to the treatment group (Gilligan *et al.*, 2008).

Quasi-experimental design has advantages in that it can draw on existing data sources; it is quicker and cheaper to implement; and it can be performed after a program has been implemented if sufficient data exist. However, it has some limitations, too. First, the reliability of the results is often reduced as the methodology is less robust statistically. Second, the methods can be statistically complex. Finally, there is a problem of selection bias that yields inaccurate results (Baker, 2000). These limitations impose methodological challenge in non-experimental evaluation methods and hence affect the reliability of results when generating a comparison groups (Foster, 2003). To avoid or reduce these problems, different econometric approaches have been developed of which some are discussed as follows:

**Difference-in-differences or double difference (DID) methods:**

This method enables evaluators to compare a treatment and comparison group before and after a program by identifying potential participants and collecting data from them. However, only a random sub-sample of these individuals is actually allowed to participate in a certain project. The identified participants who do not actually participate in the project form the

counterfactual. This method can reduce the potential selection bias and the impact of other factors exogenous to the program on observable characteristics by analyzing the difference in outcome of treatment groups relative to the difference in outcome of control groups. It looks at the difference in indicators for the two groups at the end of the program relative to the difference in indicators at the beginning (Jalan and Ravallion, 1999 and Baker, 2000).

**Instrumental variables or statistical control:**

In this method, one uses one or more variables that affect participation but not outcomes given participation. It is used to identify the exogenous variation in impact only due to the program, recognizing that the program is purposively placed rather than randomized. The instrumental variables are used to predict program participation first and then analyze how the outcome indicator varies with the predicted values (Baker, 2000).

Reflexive comparisons: this is one of the quasi-experimental methods in which a baseline survey of treatment groups is conducted prior to the intervention and a follow-up survey is done sub-sequently to measure the impact through the change in impact indicators before and after the intervention (Baker, 2000). Here, the treatment groups are compared to themselves before and after the intervention and serves as both treatment and comparison group. This method is useful in analyzing of full-coverage interventions such as nationwide policies and programs in which the entire population participates and there is no scope for a control group. However, care should be taken in applying this method as it may not be able to distinguish between the program and other external effects and hence compromising the reliability of results.

Propensity Score Matching (PSM): the idea of PSM is to find a comparison group that is similar to the treatment group in all respects except the exclusion from the program. It is useful to evaluators with time constraints and do not have baseline data but use a single cross-sectional data (Ravallion, 2005). The inherent problem in practice is usually how to define "similar". Matching may be done on many characteristics and it is not clear whether a match has to be similar in all these characteristics, and (if not) what weight should be given to each characteristic (Caliendo and Kopeinig, 2005).

The method of PSM balances the observed covariates between a participant and a control (comparison) group based on similarity of their predicted probabilities of receiving the treatment (propensity scores) and can justifiably claim to be the observational analog of a randomized experiment (Rosenbaum and Rubin, 1983). The PSM summarizes the pre-treatment characteristics of each subject into a single index variable and then using the propensity score (PS) to match similar individuals. By doing this, it solves the difficulties of matching the treated and the control subjects when there is a multidimensional vector of characteristics. It forms the probability of assignment to treatment conditional on pre-treatment variables (Rosenbaum and Rubin, 1983).

The reliability of matching estimates is based on several factors. First, participants and controls groups should have the same distribution of observed and unobserved characteristics. Second, the same questionnaire is administered to both groups. Third, treated and control groups should be selected from the same economic environment. Otherwise, the difference in mean impact of the two groups is biased estimate of the mean impact of the program (Jalan and Ravallion, 1999).

Like other methods, the PSM also has its own limitations. First, PSM is non-parametric. Hence, any functional form assumptions regarding the average differences in the outcome are not made. Second, PSM method cannot address the bias created by unobservable characteristics that might affect the outcomes (Ravallion, 2005). Third, PSM requires large amounts of data to maximize efficiency (Bernard *et al.*, 2010).

Finally, one cannot be entirely sure that he/she has actually included all relevant covariates in the first stage of the matching model and effectively satisfied the conditional independence assumption. Despite these limitations, PSM is the best method to impact evaluators with time constraint and working in the absence of baseline data in that it can be applied with a single cross-section data.

# 3 Research Methodology

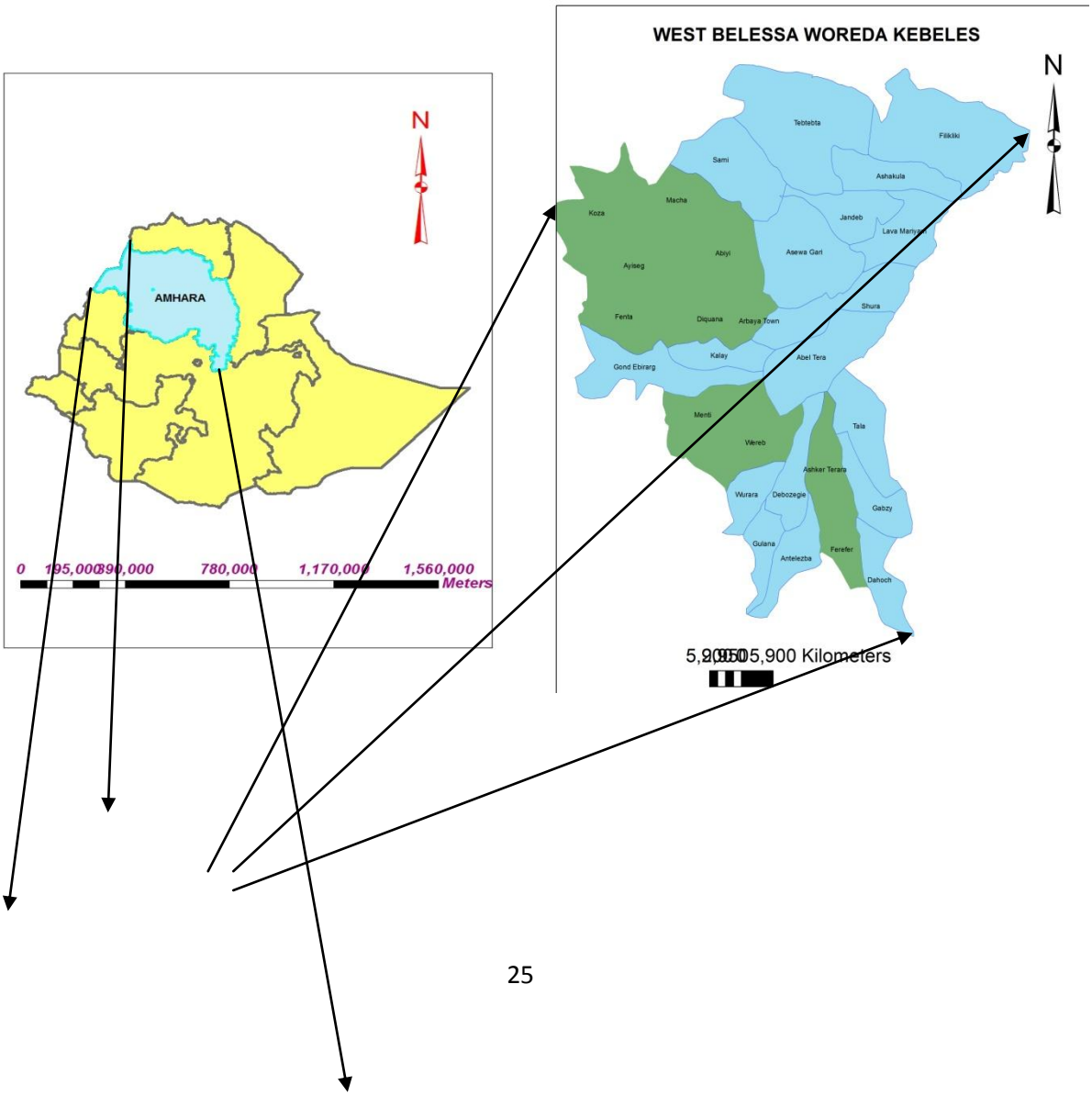
## 3.1 Description of the food security package loan Program

The food security program (FSP) was launched since 2005 in West Belesa district. The program has four components. These are Productive Safety Net program, Community complementary investment, Voluntary Resettlement program and other food security program. These components of the program have different activities and integrated each others to cop up the food insecure households from poverty. The other food security package loan is one of the food security program encompassed a suite of activities designed to support agricultural production

and food security and facilitated asset accumulation. These include access to credit, assistance in obtaining farm tools and improved seeds. The credit is provided to food insecure households at subsidized interest rate. Within the available credit the food insecure households engaged on different income generating activities with the support of agriculture extension to lead their day to day life.

In the first phase the program has different implementation problems. Given these problems, extensively redesigned the OFSP, christening the new program as Household asset Building program or Food security Package loan. Starting 2011 the program provides consultation, technical training, helped to develop on and off farm business plans based on the interest of clients and financed their business plan through ASCI from the allocated budget for package purpose.

## 3.2 Description of the study area



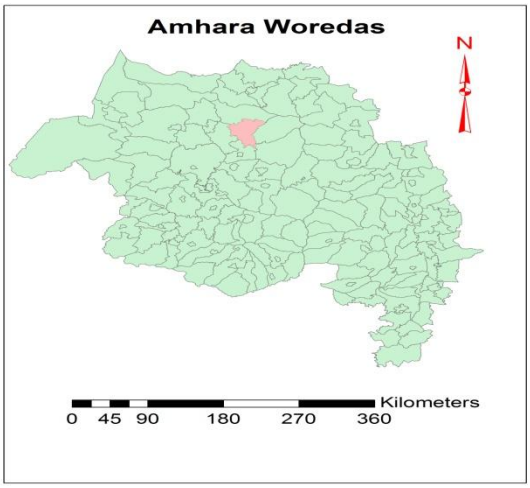



Figure 2 Map of the Study Area

The study has been conducted in West Belesa District, North Gondar Zone of Amhara National Regional State, and Ethiopia. The study area is among the chronically food insecure District of the ANRS where FSP has been implemented since 2005. The woreda has 30 adiminstrative kebles including Arbaya town, the capital city of the woreda. As indicated in above map the blue colures are food insecure kebles whereas the green colures are food secure kebles based on the fertility and productivity of farm lands. Out of 30 kebles the 19 kebels are food insecure kebles.

West Belesa District is located at about 706 km North of Addis Ababa and about 82 km of Gondar town. West belesa is bordered on the south Libo Kemkem, on the west Gondar Zuria, on the East by East Belesa, and on the North by Wogera woreda.

The district is found in the Tekeze lowland sorghum and goats livelihood zone(TSG). The District's agro ecology is predominantly Kolla which covers 59.8 %, Dega that covers 1.5%, and w/dega which also covers 38.7%. The topography is mainly characterized by plateau with 50%, mountains that encompasses 40%, hilly that covers 10% from the total land of West

Belesa District (WoA, 2016). It is largely deforested with a vegetation of bushes and shrubs. The economy of West BelesaDistrict and the larger livelihood zones it belongs is based on crop production, and the livestock rearing is the second important means of livelihood. Livestock rearing has a special importance amongst wealthier farmers.

The altitude of West Belesa District ranges from as low as 1100m to 2350 m above sea level while the minimum annual temperature ranged between $13^0$C and $35^0$C.

According to the available digital data, the mean annual rainfall for the area ranges from minimum 800 mm to maximum 1200 mm. The total populations in the woreda for fiscal year 2016 were estimated to be 192,336 and out of this 95,156 are male and 97,180 are female. Out of this 16,100 are food insecure populations which are account 8.37% of the total population (West Belessa woreda agricultural office may 2016).

### 3.2.2 Farming system and land use

West Belesa District encompasses high altitudinal differences among Kolla, W/dega and Dega are significant. Dega kebeles has about 2350 m a.s.l elevation and kolla has as lower as 1100m a.s.l. elevation. Thus, due to this reason three farming systems were identified in the District

1. Wheat, Barley, Bean/livestock (mainly sheep, cattle and horse) farming system
2. Wheat, Barley, Bean, pea, Teff/ livestock (mainly sheep and goat, cattle) farming system.
3. Sorghum, maize, millet, Sesame, Nuge and livestock (mainly cattle and goats) based farming system,

Regarding the land use the total area of the District is about 127,777 ha. Much of the District under acacia tree in Kolla and w/dega areas and eucalyptus in the Dega kebeles dominated forest and grasslands**.** Land use type and area coverage is, cultivated land 34,762 ha, grazing land 7,398 ha, bushes and shrubs 17561 and the rest are used for different purposes.

### 3.2.3 Livestock resource

Livestock production is an integral part of the production system. Production of cattle (milk, meat), sheep and goat (meat), horse, beekeeping and poultry is a common practice in West Belesa District. Cattles are exported to the Sudan and used for local market while sheep, goats are mainly used for the local market. Livestock population of the District is cattle 53,968,

goats 83,285, sheep 51,514, donkey 16,326, mule 672, horse 10, poultry 87,146 and bee hives 4660.

### 3.2.4 Rural finance

The Amhara Credit and Saving Institution (ACSI) is the major provider of credit and saving service for the rural population. The credit repayment schedule varies from one investment type to the other.

ACSI has made an agreement with the ANRS DPFSC office called the food security loan distribution agreement since 2011 to distribute loan for food insecure households to increase their asset. Thus, West Belesa District ACSI sub-branch office in line of its organization also provides loan based on the agreement taken by the ACSI main office at Bahir dar .

## 3.3 Sources and Methods of Data Collection

This research has been conducted on both qualitative and quantitative data that were collected from primary and secondary data sources. The source of the data that was used mainly the survey conducted in four Kebeles of the study district two keble from food insecure kebles and two from food secured kebles.

### 3.3.1 Primary Data Collection

Primary data has been collected through interview face to face by enumerators' using the prepared questionnaire in the field survey. Systematic random sampling with probability proportion to size sampling technique was used to select 254 sample respondents both from the credit user and non-credit user.

The primary data was including both quantitative and qualitative information gathered through face to face interview with the credit user and non-credit user individuals. The primary data that has been collected includes: information on the household characteristics; household asset holding with and without program intervention. The questionnaire has been

pre tested to evaluate the questionnaire for consistency and clarity to avoid duplication and to estimate the time requirement during data collection.

### 3.3.2 Secondary Data Collection

Secondary data sources has been taken from agricultural and Rural Development Department, ACSI, Rural development policies, food security strategies, food security programmed documents, FSP Program Implementation Manual, different studies conducted on the FSP program, evaluation reports, books, internet websites was reviewed and used for this study. Moreover, regular and statistical reports of the MoARD, CSA, MoFED, DPFSC offices were included.

## 3.4 Sample Size and Method of sampling design

Sampling is a technique, which helps us in understanding the parameters or characteristics of the universe or population by examining only a small proportion of it. Therefore it is necessary that sampling technique be reliable (Chandan, 1998). Appropriate sample size depends on various factors relating to the subject under investigation like the time, cost, degree of accuracy desired etc (Rangaswamy, 1995). But the sample size and the sample selection process procedure should assure the representative-ness of the population.

In designing survey, the determination of appropriate sample size is of paramount importance for inference of the findings based on the sample population. Currently, there are different techniques and software packages to determine sample size. However, after reviewing different literatures for determination of scientifically acceptable sample size, the researcher has preferred to use the following indicated formula.

$$n = \frac{N}{1 + N(e)^2}$$

Where: n = statistically acceptable sample size

N = Total size of target population

e = level of precision (error level) at 95%, confidence level (0.05).

Thirty kebeles that are included by the FSP are clustered in to two parts based on the food security status, i.e. food secure and food insecure kebles. Numbers of sample kebeles were selected on the basis of proportion. Thus the researcher selected four representative kebeles out of thirty FSP kebeles one from each food insecure and food secured Kebles using lottery system. The total target population for this study has been 2936 food insecure HHs who received credit during the last five years and proportionally 840 food insecure HHs who received credit in the four study kebeles of West Belesa District (WAO, 2016). Using this formula, the statistically acceptable sample size from the given population with maintaining a 95% confidence level is found to be 254 credit users and non credit user was taken from the total population.

$$n = \frac{2936}{1 + 2936\,(0.06)^2} = 254$$

The sample number of population for each kebele were determined using Probability Proportional to Size/PPS/ based on the population of credit user of household in each study kebeles and accordingly the same numbers of non- credit user HHs were also included in the sample.

Accordingly, Gulana and Wurara kebeles were selected from the food insecure kebles and Koza and Menti were selected from the food secured kebles were selected from thirty FSP kebeles. In the four sampled kebeles, 266, 114, 276 and 184 of food insecure clients were received credit in Gulana, wurara, Koza and Menti kebles respectively. The total sample size was selected using 50: 50 ratio and per kebele was determined based on probability proportional to sample size.

These sample respondents allocated for four kebles with their respective category using probability proportional to size sampling technique. Finally, the sample credit users a household farmer has been selected using systematic random sampling from the two categories based on their proportions. A total of 254 sample households were selected from food insecure HHs and food secured HHs.

The sample households (254) were selected randomly using systematic Random Sampling technique (SRS) with probability proportion to sample size/PPS/ were applied to determine the proportion of households from each sample kebeles.

Table 3.1 Proportion of food insecure HHs and food secured HHs Sample size by kebele

| Kebeles | Population Size (N) | | Sample Size (n) | | Actual Respondents |
|---|---|---|---|---|---|
| | Food insecure | Food secure | Food insecure | Food secure | |
| Gulana | 450 | 0 | 102 | 0 | **102** |
| Wurara | 390 | 0 | 55 | 0 | **55** |
| Koza | 0 | 265 | 0 | 63 | **63** |
| Menti | 0 | 185 | 0 | 34 | **34** |
| Total | 840 | 450 | 157 | 97 | 254 |

Source: WADO and Own survey results, 2017

## 3.5 Methods of Data Analysis

The impact analysis used both descriptive statistics and econometric model. Among econometric methods propensity score matching was employed to quantify important empirical results.

Both descriptive and inferential statistical and econometric tools were used to analyze the empirical data. These tools are outlined and discussed in the following section. Both qualitative and quantitative data has been compiled, sorted, edited, and represented with appropriate variables for encoding. After the data cleaned, information were coded, arranged into group variables, summarized, and tabulated for interpretation and analysis. In general data analyses have been carried out using both descriptive and econometric technique.

### 3.5.1 Descriptive Data Analysis

Descriptive statistical tools are very important to have a clear picture of the households included in the sample. Descriptive statistical techniques were employed for the purpose of

describing the demographic, socio-economic structure of sample households and the impacts of food security package loan on food insecure Annual income.

The research implemented the methodology to compare the covariates of the participant and non-participant households which are theoretically supported to influence the decision to participate or not before the matching procedure. Descriptive statistics/Quantitative data analysis were conducted using descriptive statistics such as tabulation, ratio, mean, standard deviation, percentage, t-values, and chi-square to summarize, interpret and conclude the results. Socio- economic data and household attributes have been evaluated using statistical tools. Its purposes are to evaluate the impact of food security package loan on food insecure annual income change. The study population was categorized using tables, measures of central tendency, mean difference, and other appropriate statistical tools.

### 3.5.2 Cost and Benefit analysis

Cost – benefit analysis (CBA) is a tool used to determine the worth of a project or investment CBA is quantifying analytical tool to aid decision makers in efficient allocation of resources. It identifies and attempts to quantify the cost and benefits of an investment or activity and converts available data in to manageable information. To determine which packages were most profitable among the income generating packages which implemented by food insecure households, benefit cost ratio was used. The thesis was used the net present value of money to calculated the profitability of business and the value of money in the present and future.

### 3.5.3 Econometric Analysis

Propensity score matching model was used to evaluate the impact of food security package loan on food insecure households annual income change.

**Propensity score matching (PSM) method**

According to Khandker *et al.*(2010) impact evaluation is the act of studying whether the changes in well-being are indeed due to the intervention and not to other factors. The main aim of FSP

package loan was to increase and diversify the income sources of food insecure households. To this effect, there is a need to see whether the intervention of FSP package loan has significant influence on the participant households or not. However, to compare them with and without intervention difference, baseline survey was not conducted prior to the intervention of the FSP in the study area. Therefore, this study uses PSM method because PSM is the appropriate method when such kind of problem arises. Following Caliendo and Kopeinig (2005), there are some steps in implementing PSM. These are: PSM estimation, choosing matching algorithm, checking for overlap (common support), matching quality (effect) estimation and sensitivity analysis.

**Propensity score estimation procedure**

Propensity score estimation is the first step in PSM technique. When estimating the propensity score, two choices have to be made. The first one concerns the model to be used for the estimation, and the second one the variables to be included in this model. In principle any discrete choice model can be used. Preference for logit or probit models (compared to linear probability models) derives from the well-known shortcomings of the linear probability model, especially the unlike of the functional form when the response variable is highly skewed and predictions that are outside the [0, 1] bounds of probabilities. For the binary treatment case, where estimated the probability of participation versus non-participation, logit and probit models usually yield similar results (Caliendo and Kopeinig, 2005). For this study, logit model was used to estimate propensity score.

Regarding, the choice of variables Smith and Todd (2005) suggested that economic theory, a sound knowledge of previous research and also information about the institutional settings should guide the researcher in building up the model. However, concerning the inclusion (or exclusion) of covariates in the propensity score model. The matching strategy builds on the CIA, requiring that the outcome variable(s) must be independent of treatment conditional on the propensity score. Hence, implementing matching requires choosing a set of variables X that credibly satisfy this condition.

According to Gujarati (2004), in estimating the logit model, the dependent variable is participation which takes a value of 1 if the household participated in a program and 0 otherwise. The mathematical formulation of logit model is as follows:

$$Pi = \frac{e^{zi}}{1+e^{zi}} \quad \text{----------} \quad 4$$

Where:-

Pi = $i^{th}$ household probability of food in secure who participate in the credit market which takes value 1

$$1 - Pi = \frac{1}{1+e^{zi}} \quad \text{----------} \quad 5$$

Pi = $i^{th}$ household probability of food in secure who non- participant in the credit market which takes value 0

$$Zi = \alpha + \beta X\text{i} + Ui \quad \text{----------} \quad 6$$

Where I = 1,2,3, … N

$\alpha$ = Intercept

$\beta$= regression coefficient to be estimated

$X$= Explanatory variables

$U$= a disturbance term

The effect of household's participant in the credit market on a given outcome(Y) is specified as

$Ti = Y(D = 1) - Y(D = 0)$ ---------- 7

Where Ti = a treatment effect( effect due to participation of food insecure HHs in credit ),

Yi = is the outcome on the $i^{th}$ household

Di = is whether the $i^{Th}$ household has got the treatment or not

However Y ( Di = 1 ) and Yi ( Di = 0 ) cannot be observed for the same HHs simultaneously, estimating individual treatment effects Ti is impossible and one has to shift to estimating the

average treatment effects of the population than the individual one. The most commonly used average treatment effect estimation is the average treatment effect on the treated ($T_{ATT}$) which was specified as follow

$$\mathbf{T_{ATT} = E( T/D = 1) = E[ Y ( 1 ) / D = 1 ] – E[ Y (0) / D = 1]} \text{ -------- } \mathbf{8}$$

Since the counter factual mean for those being treated, E ( Y ( 0 ) / D = 1) is not observed, there is a need to choose a proper substitute for it to estimated ATT. Though it might be thought that using the mean outcome of untreated individuals E( y(0) ) /D=0) as a substitute to the counter factual mean for these being treated, E ( Y ( 0 ) / D = 1) is possible, it is not a good idea especially in non experimental studies. This is because it is likely that components which determine the treatment decision also determine the outcome variables of interest.

In our particular case, variable those determine HHs participation in the credit market affects HHs income and employment generation. Therefore, the outcomes of individuals from treatment and comparison group would differ even in the absence of treatment leading to a self selection bias. However, by rearranging and subtracting E(y(0) / D ≠ 0) from both side of equation 7 $T_{ATT}$ can be specified as

$$E = [ Y ( 1 ) / D = 1 ] - E = [ Y ( 0 ) / D = 0 ] = T_{ATT + E}[ Y ( 0 ) / D = 1 ] - E[ Y ( 0 ) / D = 0 ] \text{ ---------- } 9$$

In equation 11 , both terms in the left hand side are observables and ATT can be identified if no self selection bias. That is if and only if E(y(0) however this condition can be ensured only in a randomize experiments (i.e where there is no self selection bias . therefore some identified assumptions must be introduced for non experimental studies to solve the selection problems .

Basically there are two strong assumptions to selection problems those are

- Conditional independence assumption
- Common support condition

Conditional independence assumption

The CIA is given as $Y_0 Y_1 \perp D / X, \forall X,$ ---------- 10

Where + indicates independence

Xi is a set of observable characteristics

Yo non participation

Y1 participants

Given a set of observable covariates (X) which are not a affected by the treatment / in this case Food insecure HHs who receive credit/, potential outcomes are increasing of their income, employment engagement, saving of food insecure HHs are independent of treatment assignment / independent of how the borrowers and non borrowers of food insecure HHs will be selected.

The implication of CIA assumption is that the selection is solely based on the observable characteristics (X) and variables that influence assignment? Participation in credit/ and potential outcomes change of income, own productive assets , smoothing consumption and engagement in different income generating activities are simultaneously observed ( Bryson et al.,2002: Caliodo and Kopeinig,2005).Hence after adjusting for observable difference, the mean of outcomes is similar for D = 1 and D = 0 . Therefore E $(Y_0 / D = 1, X) = E(Y_0 / D = 0, X$

**Common Support**

Imposing a common support condition ensures that any combination of characteristics' observed among the treatment group can also be observed among the control group (Bryson et al., 2002). The five assumption of common support is explained in the literature review in detail. Based on the above two assumption, the PSM estimator of ATT can be written as

$$T_{ATT} = E[Y_1 - Y_0 / D = 0, P(x)] = E[Y_1 / D = 1, P(x)] - E(Y_0 / D = 0, P(x)] \quad \text{---------- 11}$$

Where P(X) is the propensity score computed on the covariates X. the above equation shows that the PSM estimators is the mean difference in outcomes over the common support, appropriately weighted by the propensity score distribution of participants

**Matching techniques and algorithms**

The next step in propensity score matching is to get the matching algorism which best matches the treated observations with untreated based on the propensity scores from the preceding step. Each of the matching algorithms has its own advantages and disadvantages and the attempt of the researcher is to select a matching technique which best fits to the data at hand. Here after, matching techniques frequently used in PSM and which were used in this research are discussed.

**B. Matching estimators**: After the estimation of propensity score, the second step in PSM is choosing among different matching estimators. In theory, several matching estimators (matching algorithm) of PSM are available. However, only the most commonly applied are discussed bellow.

**Algorithm**: - a precise step-by-step plan for a computational procedure that possibly begins with an input value and yields an output value in a finite number of steps/calculation with Arabic numerals.

**Nearest Neighbor Matching (NNM):-** It is the most straightforward and frequently used matching estimator in PSM. The individual from the control group is chosen as a matching partner for a treated individual with the least distance (that is closest) in terms of propensity score (Caliendo and Kopeinig, 2005). Several variants of Nearest Neighbor matching are proposed in different literatures which can broadly fall to "with replacement" and "without replacement". In the former case, an untreated individual can be used more than once as a match, whereas in the latter case it is considered only once.

Matching with replacement involves a trade-off between bias and variance. If we allow replacement, the average quality of matching will increase and the bias will decrease while increasing the variance. This is of particular interest with data where the propensity score distribution is very different in the treatment and the control group (Smith and Todd, 2005).

A problem which is related to Nearest Neighbor matching without replacement is that estimates depend on the order in which observations get matched. Hence, when using this approach it should be ensured that ordering is randomly done. It is also suggested to use more than one nearest neighbor matching. Reduced variance will result from using more information to

construct the counterfactual for each participant, with increased bias that results from on average poorer matches (Smith, 1997).

**Caliper and radius matching**: Caliper matching is used to avoid the drawbacks of bad matches resulted from the Nearest Neighbor matching(NNM) when the closest neighbor is far away, economists impose a tolerance level on the maximum propensity score distance (caliper). Caliper matching imposes a tolerance level on the maximum propensity score distance (caliper) so that bad matches are avoided and hence the matching quality rises. In caliper matching individual from the comparison group is chosen as a matching partner for a treated individual that lies within the caliper (propensity range) and is closest in terms of propensity score (Caliendo and Kopeinig, 2005). However, caliper matching has a drawback of inability of choosing a reasonable tolerate level in advance (Smith and Todd, 2005).

**Radius matching:** a variant of caliper matching which is called radius matching (Dehejia and Wahba, 2002). Radius matching is used as an alternative to solve the drawback of caliper matching. In radius matching, the principle is to use not only the nearest neighbor within each caliper but all of the comparison members within the caliper. The advantage of this method is that it uses only as many comparison units as available within the caliper and therefore allows for usage of extra (fewer) units when good matches are not available. Hence, it shares the attractive feature of oversampling problem and avoids the risk of bad matches.

**Stratification and interval matching:** this approach partitions the common support of the propensity score into a set of intervals (strata) and to calculate the impact within each interval by taking the mean difference in outcomes between treated and control observations (Caliendo and Kopeinig, 2005). The basic question in this method is 'how much strata should be used in empirical analysis?' The answer to this question as noted by Cochrane and Chambers (1965) is using five strata can reduces 95% of biases.

**Kernel and local linear matching:** kernel matching (KM) and local linear matching (LLM) are non-parametric matching estimators that use weighted averages of all individuals in the control group to construct the counterfactual outcome and have the potential of overcoming the problems of only a few observations from the comparison group are used to construct the counterfactual outcome of a

treated individual that other estimator have in common (Caliendo and Kopeinig, 2005). These methods use more information and hence advantageous in lowering variance. However, they also have a drawback of the probability of using observations having bad match which leads to the importance of imposing the common support condition (Caliendo and Kopeinig, 2005).

As Smith (1997) noted when applying Kernel matching one has to choose the bandwidth parameter. The choice of the bandwidth parameter is quite pertinent with the following tradeoff arising: High bandwidth-values yield a smoother estimated density function, therefore leading to a better fit and a decreasing variance between the estimated and the true underlying density function. On the other hand, underlying features may be smoothed away by a large bandwidth leading to a biased estimate. The bandwidth choice is a compromise between a small variance and an unbiased estimate of the true density function and it may not be a predetermined issue.

**Weighting on propensity score:** Given several matching estimators algorithm, which approach is selected is the basic question. According to Caliendo and Kopeinig (2005) there is no the best fit algorithm fit to all cases. Rather the choice depends on the data in hand.

**C. Region of common support and overlap condition**: Imposing of common support is the third important step in PSM because average treatment effect on treated and on population is only defined in the common support region (Caliendo and Kopeinig, 2005). The common support region is the area within the minimum and maximum propensity scores of treated and comparison groups, respectively and it is done by cutting off those observations whose propensity scores are smaller than the minimum and greater than the maximum of treated and comparison groups, respectively (Caliendo and Kopeinig, 2005).

Density of comparison households: density of treatment households 0 region of common support of propensity score 1

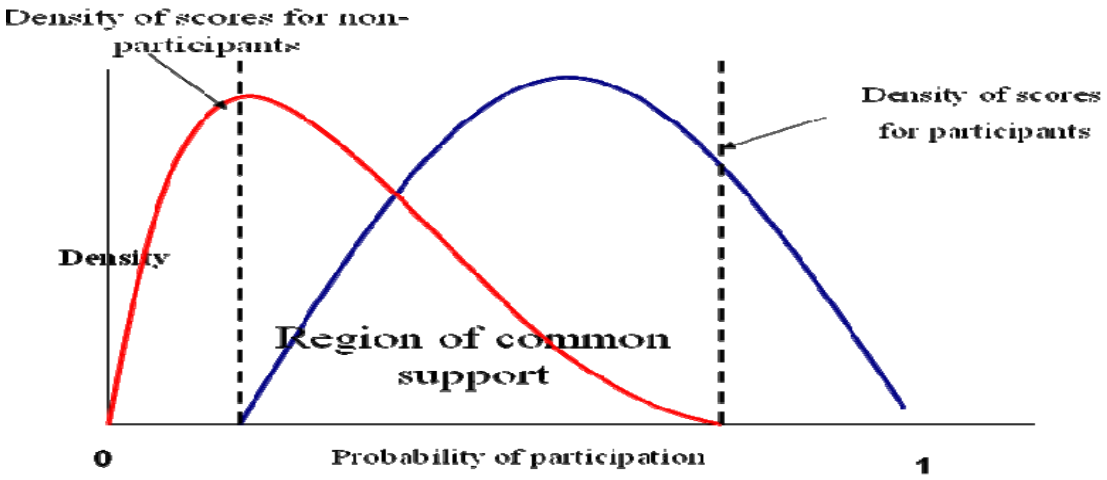



**Figure 3. Region of common support condition**

Source: Ravallion, 2005

**D. Testing the matching quality (effect analysis)**: The fourth important step in PSM is checking for matching quality whether the matching procedure can balance the distribution of different variables or not since our conditioning is on propensity score rather than on all variables in both treated and comparison groups (Caliendo and Kopeinig, 2005). While there are different procedures available to check, the basic aim of all of them is to compare before and after matching and if there still exists any difference after conditioning on propensity score. If the differences exist, there is an indication of incomplete (unsuccessful) matching and suggests remedial for actions (Caliendo and Kopeinig, 2005). There are several indicators to check for matching quality. These are: standardized bias, t-Test, joint significance and Pseudo-R2, and stratification test.

**Standardized bias (SB):** the SB is an appropriate indicator which enables to assess the distance in marginal distributions of the X-variables. Though SB is a common method used, it has a drawback if there is no a clear indication for the success of the matching procedure/ noted by Rosenbaum and Rubin (1985)/.

**T-test:** it is an approach preferred when there is a concern with significance of results. Two-sample t-test is employed to check if there is significant difference between the covariate means of treated and control group and suggested by Rosenbaum and Rubin (1985) as the covariates must be balanced after matching and there should be no significant difference

between the two groups. However, this test has a limitation of showing clearly visible bias reduction before and after matching.

**Joint significance and pseudo-R2:** The Pseudo-R2 shows how best the repressors explain the probability of participation and it should be fairly low since there should not be significant difference in the distribution of both groups after matching (Caliendo and Kopeinig, 2005).

**Stratification test**: this approach is dividing observations into strata based on the estimated propensity score to show that there is no statistically significant difference in the mean of the estimated propensity score of both treated and comparison groups as used by (Dehejia and Wahba, 1999, 2002).

### E. Multicollinearity Test

Parameter estimates of any regression model are seriously affected if some basic econometric assumptions are failed. Hence, there is a need of performing different tests before proceeding to the estimation itself. Testing the existence of multicollinearity among explanatory variables is very important since it seriously affects the parameter estimates. The Variance Inflation Factor (VIF) technique is widely used to detect the problem of multicollinearity among the continuous variables while contingency coefficient is used for testing multicollinearity among discrete variables (Gujarati, 2004).

Thus VIF is defined as:

$$VIF(X_i) = \frac{1}{1 - R_i^2}$$

Where $_{\text{Ri}}^{2}$ is the squared multiple correlation coefficient between and other explanatory variables. If the value of VIF is greater than 10, it is an indication for the existence of multicollinearity.

Contingency coefficients test is used for dummy variables using the following formula.

$$C = \sqrt{\frac{x^2}{n + x^2}}$$

Where C is contingency coefficient, $x^2$ is the chi-square value and n=total sample size. For dummy variables, if the value of contingency coefficient is greater than 0.75, it is an indication of the existence of the multicollinearity problem among them.

### F: Hetroscedasticity test

The presence of hetroscedasticity (when variances of all observations are not the same) which leads to consistent but inefficient parameter estimates should be checked for. Biases in estimated standard errors may lead to invalid inferences if hetroscedasticity problem exists, White (1980). The Breusch- Pagen test (hottest) in STATA 12 version was used to test for hetroscedasticity. In this research, robust standard errors were used to correct the problem of hetroscedasticity problem using STATA software version 12 to analyze the data. Specifically, propensity scores matching algorithm (psmatch2) developed by Leuven and Sianesi (2003) was used to evaluate the impact of food security package loan on the food insecure households annual income.

## 3.6 Variable and Hypothesis

This study review different literature to determine the treated variables and outcome variables that used commonly indicated credit access of food insecure households

**Treatment variables /** participation in food security package loan/

These variables were a dummy variable that takes either 1 or o values. For the food insecure HHs / treated group/ who participate in the credit access takes 1 value and 0 value for the Food secure HHs does not participate in the food security program/ control groups/. The covariant variables were age of household head, Sex, Educational status, family size, credit access and period of credit disbursement. These variables were used in the PSM model for matching purpose. The characteristics' of these variables were affected the food insecure HHs to be affected the food insecure to be participate in the credit accessibility and outcomes of participants and non participants directly and indirectly.

**Age of head of household (AGE)** Age is continuous variable and measured in a year. old people have relatively richer experience of access to credit markets greater experience of participating in income generating activities.that is whene food in secure households get higher age, they are expected to have higher income than non-participants of food insecure households. Therefore the expected effect of age on food insecure households who access to credit market would be positive sign

**Sex of head of the house hold(SEX)** Sex is of the house hold is a dummy variable .gender is a matter of determining in credit market out came .Female house hold heads age relatively access to credit market and their impacts of outcomes variables of credit is less the male head house hold heads. (Tilahun 2015) therefore sex has a positive sign to determine the effect of impact of access to credit market for those food insecure male headed households

**Religion of the Household Head /RHH/:** religion the household head is a dummy variable that affects the food insecure households on participating of credit market. As a result it would affect the impact of credit on food insecure household incremental of income. Christian food insecure HHs would participate in the credit market and positive sign than Muslim Food insecure Households

**Household Family size (HHFS):** The size of household is a continuous variable and measured in family labor force. Due to increasing in family size the family labor force can be increased. According the literature reviewed higher family size have relatively higher family labor force which may boost both agricultural production and willingness to financial entities to lend those HHs expecting better repayment as result of a relative higher agricultural outputs(Tilahun , 2015). Therefore food insecure HHs that has higher family size who access to credit market has positive relationship with the outcome variables and greater value than the non participants.

**Marital status of the households (MSHH);-** this is a discrete variable and it determines the impact of credit on food insecure households who access in the credit market have positive sign on the impacts of credit outcome variable than the food insecure households of non-participants(Tilahun , 2015). The married food insecure HHs who access in the credit market have positive sign on the impacts of credit outcome variables than the unmarried and divorce food insecure HHs heads.

**Educational level: -** it is continues variable measured in terms of years. It has vital role in shaping the behavior of household members and using the credit properly on the extended plans (Tilahun , 2015).. Therefore educated food insecure HHs who access in the credit market have positive impact on the outcome variables. Improving financial access helps small holder farmers to improve production and productivity (Amha and peck, 2010, Amha, 2011). Therefore in this study expected the same result.

**Own farm Land:** the food insecure household who own large amount of own land would participate on the food security package loan. It is continues variable measured by ha.

**Period of credit disbursement: -** it is a discrete variable which affects the food insecure HHs welfare due to the availability of credit on the appropriate time to run a business. According the Ethiopian fiscal year quarter two and three has more preferable and appropriate to run business and the credits which disburse at that time has positive impact than which disburse in the $1^{St}$ and $4^{th}$ quarter.

**Access to credit**: it is a dummy variable which is important factor to determine on the impact of food insecurity income. Improving financial access smallholder farmers to improve production and productivity(Amha and peck, 2010). Therefore in this study the same result would be expected.

**Agriculture Extension service Provision:** The development agents consulted the food insecure households about the aim and the objective of the food security package loan. In addition to this they mobilized and targeting the food insecure households for the program service. The more awakened and consulted food insecure households become participated to the food security package loan.

**Business skills of food insecure Households:** The food insecure houses have their indigenous business skills and experience. The food insecure households who have skills and experience both on on-farm and off farm activities would participate in the food security package loan.

**Repetition of Borrowing Times of the Household head:** it is a dummy variable how many times the food insecure household borrowed during the last five years and it takes 0 for one time

and 1 for twice and above. Repetition of loan more than one would has positive impact on the Food insecure HHs

**Outcome variables**

The main outcome variables that were reflected as a result of food insecure households participate in the food security package loan market accessibility was determined by this research was economic variables like increasing of income, owner of in rented farm land, saving of money in financial institutions, employment generation, food and non food consumption and house improvements and sending children to formal education.

Drive from these outcome variables the research hypotheses that were examined to analysis the impact of food security package loan on food insecure households' income was formulated as follow;

1. Food insecure HHs who participates in the food security package loan were increasing their income more than the non participants of food insecure HHs.

   $H_o$: the food insecure households who accessed to the food security package have diversified sources of income and increased the annual income greater the food secured household who does not participated in the credit market.

   $H_1$: the food insecure households who accessed to the food security package have diversified sources of income and increased the annual income less than the food secured household who does not participated in the credit market.

The description and types of explanatory / covariate variables/ and the dependent variables / outcome variables that included in this study is generalized in the following table

Table 3.2 Description and types of both covariate and outcome variables

| Variables | Description of variables | Types of variables |
|---|---|---|
| Dependent variables / Outcome variables/ | | |
| POFSCM | Food security status of the HHs food secure HHs = 0, Food insecure = 1 | Dummy |

| | | |
|---|---|---|
| FSINCM | Food insecure households who increase their annual income due to engage in different on farm and off farm activities yes = , no = 0 | Dummy |
| ONFMINCM | Amount of income earns from on-farm activities measured in ETB | continuous |
| OFFMINCM | Amount of income earns from off-farm activities measured in ETB | continuous |
| FRMLND | Farm lands cultivated by food insecure households their own farm land measured in ha | continuous |
| Land Rent | Rented Farm lands cultivated by food insecure households by sharing or renting farming lands measured in ha | continuous |
| HHEMGN | Member of food insecure households who participate on different income generating activities/ self employed / | discrete |
| SVMNY | Amount of saved by the food insecure households measured in ETB | Continuous |
| HHHOUSE | The type of residence house owned by food insecure households , if he own an iron corrugated house = 1 other wise = 0 | dummy |
| HHCNSM | Food insecure households increase in consumption to be self sufficient in food need measured in month | Discrete |
| Explanatory Variables / Covariates/ | | |
| AGE | Age of food insecure household head in year | Continuous |
| SEX | Sex of food insecure household head / male = 1 , female = 0/ | |
| HHFS | No of family members live together within the food insecure household head | Discrete |
| RHH | Religion the household head is a dummy variable that take 1 for Christian and 0 for Muslim. | dummy |
| MSOHH | Marital status of food insecure households head/ married, unmarried and divorce/window | Discrete |
| Edu | The food insecure household headed educational status | continues |
| PCDISB | Period of credit disbursement to food insecure households categorized by quarter | Discrete |

| | | |
|---|---|---|
| HHACTC | Food insecure household head who access to credit / yes = 1 no = 0/ | Dummy |
| Agri exn | Food insecure households who access to agricultural extension service / yes = 1, no = 0) | Dummy |
| Bpskills | Business skills and experience of food insure households who participated in on farm = 1, off farm 2 and both 3 | Discrete |
| RBTHH | How many time the food insecure households borrowed during the last five years. It takes 0 for once and 1 for two and above | Dummy |

Source Author definition, 2017

# CHAPTER FOUR

## 4. Result and Discussion

This chapter presents the analysis of the main results and discussion. It is divided into two subsections. The first subsection provides the descriptive statistics of sampled household while the second subsection discussed the economic estimation results.

Specifically the characteristics of the impact of food security package loan on food insecure households' annual income of the sampled households were analyzed and discussed using descriptive statistics and an econometric result of logistic regression results.

## 4.1 Descriptive Analysis

The descriptive statistics were described for both groups of participants in the food security package loan (treated groups) and non participants in the food security package loan households (the controlled groups). The analysis is carried out after Food insecure household who participated in food security package loan is matched with non participants' households on their observed pre-program characteristics. The matching procedures are done based on the propensity score matching (PSM) technique.

### 4.1.1 Demographic Characteristic of the food insecure Sampled Household.

#### 4.1.1.1 Age and Family size of the Sampled Household Head

Age of the household is one of the factors which affect family labor of household in farming community. As the age progress; farmers' acquired experience and knowledge (Asqual Berhe, 2010). As presented in table 4.1 below the age of the food insecure households who participated in the food security package loan were ranges from 20 to 86 with a mean and standard deviation of 45.97 and 14.87 respectively. Whereas the food secure household who did not participated in the food security package loan were from 20 to 90 with a mean and standard deviation of 44.86 and 14.01 respectively. As showed in the T-Value which is -0.59 there is no statistical difference between the food insecure and food secures of households in terms of age.

To cover all family members' food and non food demand, it requires high participation in different income generating activities. To participate in different income generating activities, it needs finance either from your own source or external source of financial institution. This determines family size has a factor on participating on credit market. As indicated in table 4.1 the family size of food insecure HHs ranges from 1 to 9 with 3.71 and 1.79 mean and standard deviation respectively. On the other hand the family sizes of food secured HHs were ranges from 1 to 7 with 4.07 and 1.4 mean and standard deviation respectively. The T –value (1.71*) showed

that there is statistical difference at 10% level between the food insecure HHs and food secured HHs. The labor force of food insecure HHs ranges from 0.75 to 6.8 with a mean of 2.19 while the food secure HHs of labor force was ranged from 0.75 to 5.6 with a mean of 2.3. As the t-Test showed in table 4.1 there was no statistical difference between the food insecure HHs and food secured HHs in terms of labor force

Table 4.1 Age, Family size and Labor force composition of sampled household head

| | Food insecure HHs | | | | Food secure HHs | | | | Total | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Varaible | Mean | Std Dv | Min | Max | Mean | Std Dv | Min | Max | Mean | Std Dv | Min | Max | T-Value |
| Age | 45.97 | 14.87 | 20 | 86 | 44.86 | 14.01 | 20 | 90 | 45.5 | 14.5 | 20 | 90 | -0.59 |
| Family Size | 3.71 | 1.79 | 1 | 9 | 4.07 | 1.40 | 1 | 7 | 3.8 | 1.7 | 1 | 9 | 1.71* |
| Labor force/ AE | 2.19 | 1.47 | 0.75 | 6.8 | 2.39 | 1.12 | 0.75 | 5.6 | 2.27 | 1.35 | 0 | 6.8 | 1.14 |

Source: Own survey data, 2017

* Significance level at 10%

#### 4.1.1.2 Sex and Marital status of the Sampled Household Head

Gender differentials were playing a significant role in the economy. It is assumed that male house hold headed borrowers more participated in the food security package loan than the female house hold headed borrowers. As illustrated in table 4.2 75.8% of the food insecure household who participated in credit market was male head households where as the rest 24.2% were female head households. Whereas the non-participants of food security package loans were 67.01% and 32.99% male and female headed households. As described in table 4.2 below using chi square 2.31 showed that there is no statistically difference between the food insecure HHs and food secure HHs in terms of sex. As the research proposed, male headed food insecure households were more participants in the food security package did not hold.

Variation in marital status has an important bearing on the size and structure of households.' Marital status of the households determines the needs of credit from the food security package

loan. As indicated in table 4.2, 7.64%, 74.52% and 17.83% of the food insecure HHs were single, married and divorced respectively. On the contract the food secure HHs were 5.15%, 69.07% and 25.77% were single, married and divorced respectively.

The chi-square test (2.61) showed that there is no statistical variation between the food insecure HHs and food insecure HHs.

The religion of both food insecure HHs and food insecure HHs were similar and cause co linearity between the explanatory variable due to this the output of chi-square does not exist and the research exit this variable from the analysis.

Table 4.2 Sex and marital status of the sampled Household Heads

| **Variable** | **Attribute** | Food insecure HHs | | Food secure HHs | | **Total** | | **Chi-square** |
|---|---|---|---|---|---|---|---|---|
| | | **N** | **%** | **N** | **%** | **N** | **%** | |
| Sex | Female | 38 | 24.20 | 32 | 32.99 | 70 | 27.56 | 2.31 |
| | Male | 119 | 75.80 | 65 | 67.01 | 184 | 72.44 | |
| | Total | 157 | 100.00 | 97 | 100.00 | 254 | 100.0 | |
| Religion | Orthodox | 157 | 100.0 | 97 | 100.0 | 254 | 100.0 | |
| Martial | Single | 12 | 7.64 | 5 | 5.15 | 17 | 6.69 | 2.61 |

Source: Own survey data, 2017

## 4.2 Scio- Economic Characteristic of the food insecure Sampled Household.

### 4.2.1 Educational Background of the Sampled Household Head

Education is a social capital which has a positive impact on household ability to understand and utilize new technological information and also to know their rights and obligations. It can help them to understand their rights to borrow food security package loan and also their obligation to repay their debt on time. But lack of education and poor awareness level thereof may be a bottleneck to manage the input credit and repay on the stated repayment date. As presented in table 4.3 the mean and standard deviation of food insecure HHs and food secure HHs are 0.85, 2.25 and 0.84, 2.17 respectively. The T-test showed that there is no statistical difference between the food insecure HHs and food insecure HHs.

Table 4.3 Educational Background of Sampled Household Head

| | Food insecure HHs | | | | Food secure HHs | | | | Total | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Varaible | Mean | Std Dv | Min | Max | Mean | Std Dv | Min | Max | Mean | Std Dv | Min | Max | T-Value |
| Edu | 0.85 | 2.25 | 0 | 10 | 0.84 | 2.03 | 0 | 12 | 0.84 | 2.17 | 0 | 12 | -0.04 |

Source: Own survey data, 2017

### 4.2.2 Food insecure Households Contact to Agricultural extension

As presented in table 4.4 showed that only 14.01 % of food security package loan participant and 20.62 % of non participant sample households were not contacted with the development agent to get agricultural extension service at all in the year 2016. The majority of both food insecure HHs sample households, 85.99.9%, were contacted with DA to got agricultural extension service where as 79.38% of food secure HHs were taking agricultural extension service in the year of 2016. The chi-square showed in table 4.4 there was no statistically difference between the dependent variables in terms of contact with DA to got agricultural extension service.

Table 4.4 Food insecure Household Contact to Agricultural extension

| **Variable** | **Attribute** | **Food insecure** | | **Food secure** | | **Total** | | **Chi-square** |
|---|---|---|---|---|---|---|---|---|
| | | **N** | **%** | **N** | **%** | **N** | **%** | |
| Agricultural Extension Service | Contact with DA | 135 | 85.99 | 77 | 79.38 | 212 | 83.47 | 0.63 |
| | Didn't contacted with DA | 22 | 14.01 | 20 | 20.62 | 42 | 16.53 | |
| Total | | 157 | 100 | 97 | 100 | 254 | 100 | |

Source: Own survey data, 2017

### 4.2.3 Saving Habit of the Sample Household

Saving is key economic terms that solve different economic problems of the food insecure households.' The one who saved in any financial institution may solve smoothing his consumption level in the drought period or peak hunger period. She/he would be easily with

draw his saving amount from the saved institution. On good year the one who saved money in any financial institution could invest his saved money in other high income earning activities either by draw his money or by collateral his saved money, she/he would borrowed more that his saved money particularly if he save his money in RUSACCO.

As presented in table 4.5 the 38.85%, 11.46%, 44.59%, 2.55 % and 2.55% of the food insecure HHs were not participated in any financial institution, saved money in ACSI, saved money in RUSACCO, Saved money in ACSI and RUSACCO and in Banks respectively where as 52.58%, 12.37%, 32.99%, 1.03 % and 1.03% of the food secure HHs were not participated in any financial institution , saved money in ACSI, saved money in RUSACCO, Saved money in ACSI and RUSACCO and in Banks respectively. As in the chi-square output indicated 6.01 that there were not statistical difference between the food insecure HHs and food insecure HHs in terms of saving in different financial institutions.

Table 4.5 Saving habit of the food insecure households

| **Variable** | **Attribute** | Food insecure HHs | | Food secure HHs | | **Total** | | **Chi-square** |
|---|---|---|---|---|---|---|---|---|
| | | **N** | **%** | **N** | **%** | **N** | **%** | |
| Institution | Not save in any Financial institution | 51 | 52.58 | 61 | 38.85 | 112 | 44.09 | 6.01 |
| | saved in ACSI | 12 | 12.37 | 18 | 11.46 | 30 | 11.81 | |
| | saved in Rusaco | 32 | 32.99 | 70 | 44.59 | 102 | 40.16 | |
| | saved both in ACSI & Rusaco | 1 | 1.03 | 4 | 2.55 | 5 | 1.97 | |
| | Saved in bank | 1 | 1.03 | 4 | 2.55 | 5 | 1.97 | |
| | Total | 97 | 100.00 | 157 | 100.00 | 254 | 100.00 | |

Source: Own survey data, 2017

### 4.2.4 Sampled Households Business Skills

The food insecure household knowledge and experience of farm and non-farm activities accomplishments are better to involved in food security package loan. Business skills of the rural food insecure households' mean that agricultural and non-agricultural /off farm activities / experience to generate their annual need of income for the households members. As illustrated in

table 4.6, 42.04%, 1.91% and 56.05% of the food insecure HHs was experience on practicing of on farm, off farm and both on farm and off farm activities respectively. On the contrast 69.07%, 9.28% and 21.65% of the food secure HHs was experience on practicing of on farm, off farm and both on farm and off farm activities respectively. As showed in the chi-square there was statistical significance between the food insecure HHs and food insecure HHs. Food insecure households that have both on farm and off farm bushiness skills participated more than the food secure HHs in the food security package loan.

Table 4.6 Food insecure Households' Business Skills and Experience

| **Variable** | **Attribute** | Food insecure HHs | | Food secure HHs | | **Total** | | **Chi-square** |
|---|---|---|---|---|---|---|---|---|
| | | **N** | **%** | **N** | **%** | **N** | **%** | |
| Business skill | Haven't experience | 2 | 1.27 | 0 | 0 | 2 | 1.27 | 33.97*** |
| | On Farm | 64 | 42.04 | 67 | 69.07 | 131 | 51.57 | |
| | Off farm | 3 | 1.91 | 9 | 9.28 | 12 | 4.72 | |
| | Both | 88 | 56.05 | 21 | 21.65 | 109 | 42.91 | |
| | Total | 157 | 100.00 | 97 | 100 | 254 | 100.00 | |

Source: Own survey data, 2017

* ** High significance level at 1%

### 4.2.5 Sampled Households Participation of on Income Generating Packages

In the food insecure woreda Food security package loan was disbursed based on the business plan that has been prepared during the last five years at household level. The business plans would be simple, demand driven and based on households' technical capacity, market opportunity and appropriate choices to technologies,(PIM, 2010).

The development agents have a key role to play in over all food security programs implementation. It includes implementation of food security program package based on the households' decision making, be member of KFSTF & CFSTF, supports the CFSTF in prioritizing community needs and preparing annual plan of FSP and assist households in the preparation and implementation of business plans were outcomes of households decision. In order to undertake this wide range of activities, considering efforts has been made to increasing the number of development agents per keble from year to year. Based on the consultation of

development agents the food insecure households' was run their business activities and participate on the following income generating activities or packages. The food insecure HHs 10.19%, 14.01%, 17.2%, 5.73%, 38.85%, 3.8%, 5.09%, 5.1%, 0.64%, and 1.27% were participated in crop, dairy, shoat rearing, shoat fatting, ox fatting, animal trade, local beer, weaving, poultry and petty trade packages. In contrast the food secured HHs 12.37%, 1.03%, 18.56%, 6.19%, 35.05%, 12.37%, 11.34%, 3.09%, were participate in crop, dairy, shoat rearing, shoat fatting, ox fatting, animal trade, local beer, weaving, poultry packages. As showed in chi-square there was statistical significance between the food insecure and food secured HHs.

Table 4.7 Participation of Food insecure Households' on different packages

| Variable | Attribute | Food insecure HHs | | Food secure HHs | | Total | | Chi-square |
|---|---|---|---|---|---|---|---|---|
| | | N | % | N | % | N | % | |
| Package | Crop | 16 | 10.19 | 12 | 12.37 | 28 | 11.02 | 241.74*** |
| | Dairy | 22 | 14.01 | 1 | 1.03 | 23 | 9.06 | |
| | shoat rearing | 27 | 17.20 | 18 | 18.56 | 45 | 17.72 | |
| | shoat fatting | 9 | 5.73 | 6 | 6.19 | 15 | 5.91 | |
| | ox fatting | 61 | 38.85 | 34 | 35.05 | 95 | 37.40 | |
| | animal trade | 8 | 5.09 | 12 | 12.37 | 20 | 7.87 | |
| | local beer | 8 | 5.10 | 11 | 11.34 | 19 | 7.48 | |
| | Weaving | 5 | 3.18 | 3 | 3.09 | 8 | 3.15 | |
| | Poultry | 1 | 0.64 | 0 | 0.00 | 1 | 0.39 | |
| | Total | 157 | 100.00 | 97 | 100.00 | 254 | 100.00 | |

Source: Own survey data, 2017

*** High significance level at 1%

### 4.2.6 Food insecure Household Time of Credit Demand

The food security package loan encompassed a suite of activities have been designed to support the agricultural production, food security and to facilitate the asset accumulation. This program was designed to the food insecure households' to provide a subsidized credit for the purpose of purchasing packages, based on the business plan development. In the first evaluation of food

security program, Gilligan et.a, (2007) noted that except Tigray region access to package loan was low. As presented in the above table 4.5 0%, 42.68 % , 56.69 % , 0.64% of the food insecure HHs were applied to got credit in 1st , 2nd quarter, 3rd quarter and 4th quarter respectively. Whereas the food secure HHs 96.9 %, 1.03%, 2.03% and 0 % were applied to got credit in 1st , 2nd quarter, 3rd quarter and 4th quarter respectively. Out of these users and non users only 11.46%, 73%, 66% of the food insecure households' receive credit 2nd quarter, 3rd quarter and 4th quarter respectively. As indicated in the proposal thesis, credits which were disbursed to the user during the 2nd and 3rd quarters were on time and would contribute income increasing of the the food insecure HHs.' This due to all raw materials for different income generating activities at rural community level is available and relatively cheap during these quarters. Whereas during 4th quarter all raw materials for different income generating activities at rural community level is scarce and relatively expensive during this quarter and partly it would affect negatively the credit users annual income. As analyzed in this research 42.04% of the food insecure HHs have been received their credits lately and would affect their annual income negatively. As illustrated in the chi-square test there is statistically difference between the Food insecure HHs and the food secure HHs in terms of applying and receiving their package loan.

Table 4.8 Food insecure Household Period of Credit Request and Received Quarter

| **Variable** | **Attribute** | Food insecure HHs | | Food secure HHs | | **Total** | | **Chi-square** |
|---|---|---|---|---|---|---|---|---|
| | | **N** | **%** | **N** | **%** | **N** | **%** | |
| Request | 1st quarter | 0 | 0.00 | 94 | 96.91 | 94 | 37.01 | 241.53*** |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Quarter | 2nd quarter | 67 | 42.68 | 1 | 1.03 | 68 | 26.77 | |
| | 3rd quarter | 89 | 56.69 | 2 | 2.06 | 91 | 35.83 | |
| | 4th quarter | 1 | 0.64 | 0 | 0.00 | 1 | 0.39 | |
| | Total | 157 | 100.00 | 97 | 100.00 | 254 | 100.00 | |
| Received | 1st quarter | 0 | 0.00 | 97 | 100.00 | 97 | 38.19 | 254*** |
| Quarter | 2nd quarter | 18 | 11.46 | 0 | 0.00 | 18 | 7.09 | |
| | 3rd quarter | 73 | 46.50 | 0 | 0.00 | 73 | 28.74 | |
| | receive lately | 66 | 42.04 | 0 | 0.00 | 66 | 25.98 | |
| | Total | 157 | 100.00 | 97 | 100.00 | 254 | 100.00 | |

Source: Own survey data, 2017

*** High significance level at 1%

4.2.7 The Contribution of Food security Package loan on Food insecure households' Income

Based on the survey data food security package loan has been increased the food insecure households' who participated in the food insecure package credit market. As presented in the table 4.9 below out of 157 treated members 138 of them said I have been changed my annual income. The rest of 19 out of 157 members said that "I have not been changed on my annual income." Based on the survey data the food security package loan has been changed the annual income of food insecure households who participated in the credit market

Table 4.9 Role of Food security package loan on Food insecure Household Annual Income Change

| **Variable** | **Attribute** | Food insecure HHs | | Food secure HHs | | **Total** | | **Chi-square** |
|---|---|---|---|---|---|---|---|---|
| | | **N** | **%** | **N** | **%** | **N** | **%** | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| FSINCM | no change on their Annual income | 19 | 12.10 | 72 | 74.23 | 91 | 35.83 | 100.64*** |
| | changed their annual | 138 | 87.90 | 25 | 25.77 | 163 | 64.17 | |
| | Total | 157 | 100.00 | 97 | 100.00 | 254 | 100.00 | |
| Reason to increase their income or not | started in new business | 40 | 25.48 | 0 | 0.00 | 40 | 25.48 | 242.41*** |
| | solved shortage of initial capital | 57 | 36.31 | 0 | 0.00 | 57 | 22.44 | |
| | expand existing business | 41 | 26.11 | 0 | 0.00 | 41 | 16.14 | |
| | no changed at all | 31 | 19.75 | 3 | 3.09 | 34 | 13.39 | |
| | not received credit at all | 0 | 0.00 | 94 | 96.91 | 94 | 37.01 | |
| | Total | 157 | 100.00 | 97 | 100.00 | 254 | 100.00 | |

Source: Own survey data, 2017

*** High significance level at 1%

### 4.2.8Profitability Of Food security Package Loan in the Study Area

Most of the food insecure households who were used food security package loan was allocated their credits on productive assets that generating additional income to the household annual income. Most of the Food insecure HHs were participated on ox fatting, shoat rearing and dairy packages. But to answer the profitability of the packages it needs comparison of its discounted total cost with its discounted total benefit. Based on the survey data and estimated in the above table the discounted benefits cost ratio of each packages result were 7.77, 6.27, 3.35, 3.2, 1.87 and 1.18 for the weaving, poultry, ox fatting, onion production, shoat rearing and dairy respectively. In terms of discounted total cost and total benefits gained from the packages the higher the benefit cost ratio was the higher profitable of the package. As assessed in this research the weaving, poultry and ox fatting was ranked 1 up to 3 levels respectively. The weaving package was a profitable package in the study area. This was due to monopoly type of market that operate its business in near the woreda's town market and availability of cotton in the local rural area with relatively cheapest raw materials. The other package were relatively competitive with others small holder farmers and to run the business it takes long time at least three or more than months.

Table 4.10 Food insecure households' participated packages and Its Profitability

| S.N | Types of Package | Total cost | Participation of Client in % | Total Revenue | Net Profit | Discount Benefit @12% | Discount Cost @12% | Disted B/C Ratio | rank |
|---|---|---|---|---|---|---|---|---|---|
| **1** | ox fatting | 24,000 | 38.85 | 104,400 | 80,400 | 23,928.6 | 7142.85 | 3.35 | **3rd** |
| 2 | shoat rearing | 10,000 | 17.20 | 28,700 | 18,700 | 5565.48 | 2976.20 | 1.87 | **5th** |
| 3 | Dairy | 14,000 | 14.01 | 30,500 | 16,500 | 4910.71 | 4166.65 | 1.18 | **6th** |
| 4 | Onion/ by irrigation/ | 15,000 | 0.64 | 63,000 | 48,000 | 14,285.7 | 4464.30 | 3.20 | **4th** |
| 5 | Poultry | 6,000 | 0.64 | 43,600 | 37,600 | 11,190.5 | 1785.7 | 6.27 | **2nd** |
| 6 | Weaving | 7,000 | 3.18 | 63,400 | 54,400 | 16190.45 | 2083.35 | 7.77 | **1st** |

Source: Own survey data, 2017

## 4.4 Econometric model Result Analysis

### 4.4.1 Propensity score matching model result

According to Rosenbaum and Rubin (1993), PSM is the conditional probability of assignment to a particular treatment given a vector of observed covariate. In this study PSM was used to estimate the impact of Food security package loan on the food insecure households' annual income in the study area. In addition to this PSM was helped to control pre-intervention

difference on the covariates. Logistic regression model was applied to estimate propensity scores for matching program Food insecure households with Food secure households. In the estimation process, households were pooled in such a way that the dependent variable takes a value 1 if the household is participant and 0 otherwise.

VIF for continues variables and contingency coefficient for dummy variable were calculated in order to detect the presence of strong multicollinearity problem among the covariates. As shown in table 4.17 except own land and labor force the other covariates had no serious problem of multicollinearity. Consequently, own land and labor force was dropped from the estimated model to avoid biased estimation. In addition to this Robust standard errors were estimated using Breusch-Pagan test to detect hetroscedasticity test dummy variable. As showed in the P-value business skills were highly significance that is p-value = 0.000 implying that there is a problem of hetroscedasticity. When the research was dropped this variable the more than half of the observation become out of analysis. So in order to solve this problem the research was used robust test. Therefore most of the observation to be the analysis part the analysis and did not drop.

After checking multicollinearity and heteroscedasticity assumption of regression model, the propensity score or the likelihood of participation for a given household is estimated using logit model where the dependent variable is program participation and taking 6 pre-intervention covariates as independent variables. it was found that the estimated model appears to perform well for our intended matching exercise.

As shown in table 4.17 3 out of 8 covariates significantly affect the program participation decision of households in the study area. The interest of the matching procedure is to get participant households from non-participants with similar probability of participation given the explanatory variables. If the number of explanatory variables affecting the participation decision is limited, it created a good opportunity for matching and it makes the matching procedure less difficult since matching algorism is implemented to eliminate significant differences of explanatory variables between Food insecure HHs and Food secure HHs.

**Table 4.11 Logistic regression model estimation of household estimation**

| Covariates | Coef. | Std. Err. | T-value | P-Value |
|---|---|---|---|---|
| Age | 0.010672 | 0.011323 | 0.94 | 0.346 |
| Sex | | | | |
| Male | -0.01498 | 0.428724 | -0.03 | 0.972 |
| Edu | -0.04023 | 0.07194 | -0.56 | 0.576 |
| Msohh | | | | |
| Married | -0.27222 | 0.658687 | -0.41 | 0.679 |
| Divorced | -0.92528 | 0.675476 | -1.37 | 0.171 |
| HHAE | -0.29089 | 0.127915 | -2.27** | 0.023 |
| Agriexn | 0.178278 | 0.365503 | 0.49 | 0.626 |
| Ownland | 0.570152 | 0.23023 | 2.48** | 0.013 |
| Busskills | 0.843868 | 0.164754 | 5.12*** | 0.000 |
| _cons | -1.13393 | 0.823166 | -1.38 | 0.168 |

Source: Own estimation. *** and** means significant at 1% and 5% probability levels, respectively.

The test statistics in the above table 4.11 indicates the participation of Food security package loan was strongly influenced by the three variables. Own land holding, labor force and business skills have positive and significance influence on the participation decision of a given households. This may be due to people with large number of own land may need additional capital other than their own financial capital to run business or participate in income generating activities. This in turn facilitates the participation decision of households. Business skill was robusted to solve the heteroscedasticity problems.

### 4.4.2 The common support condition

The other required criterion to match the treated households with untreated households is to find out the common support region. There are two approaches to map a common support region for the propensity score distribution; these are minima & maxima and trimming approaches (Caliendo and Kopeinig, 2005). Moreover, Leuven and Sianesi (2003) recommend the use of both the common and "trimming" approaches at the same time for the identification (imposition) of a common support. Even though it is recommended to use both approaches together, in evaluation studies using PSM the approach that yields in good match is preferred.

After defining the common support region, those observations in the common support region have been matched with the other group and others which were not in the common support region were out of further consideration. The estimated propensity scores in table 4.12 vary between 0.17 and 0.95 (mean =0.67) for food security package loan participant households and between 0.21 and 0.92(mean = 0.53) for non-participant (control) households. Based on the minima and maxima criteria the common support region would then lay between 0.21 and 0.92. In other words, households with estimated propensity scores less than 0.21 and greater than 0.92 will not be considered for the matching exercise.

Table 0.12 Distribution of estimated propensity scores

| Group | Observation | Mean | Std. Dev. | Min | Max |
|---|---|---|---|---|---|
| Food insecure HHs | 157 | .6739897 | .1761324 | .1712023 | .9544923 |
| Food secured HHs | 97 | .5276662 | .1684542 | .2130317 | .926299 |
| Total households | 254 | .6181102 | .1870027 | .1712023 | .9544923 |

Source: Own estimation, 2017

In similarly manner, the below figure showed the distribution of the propensity score for total households, food security package loan participant and non-participant household. In case of treatment households, most of them were found in the left and middle part of the distribution. On the other hand, most of the control households were partly found in the center and partly in the right side of the distribution. Since most of the participant and non-participants households are located in the middle of the distribution, it makes the matching procedure simple.

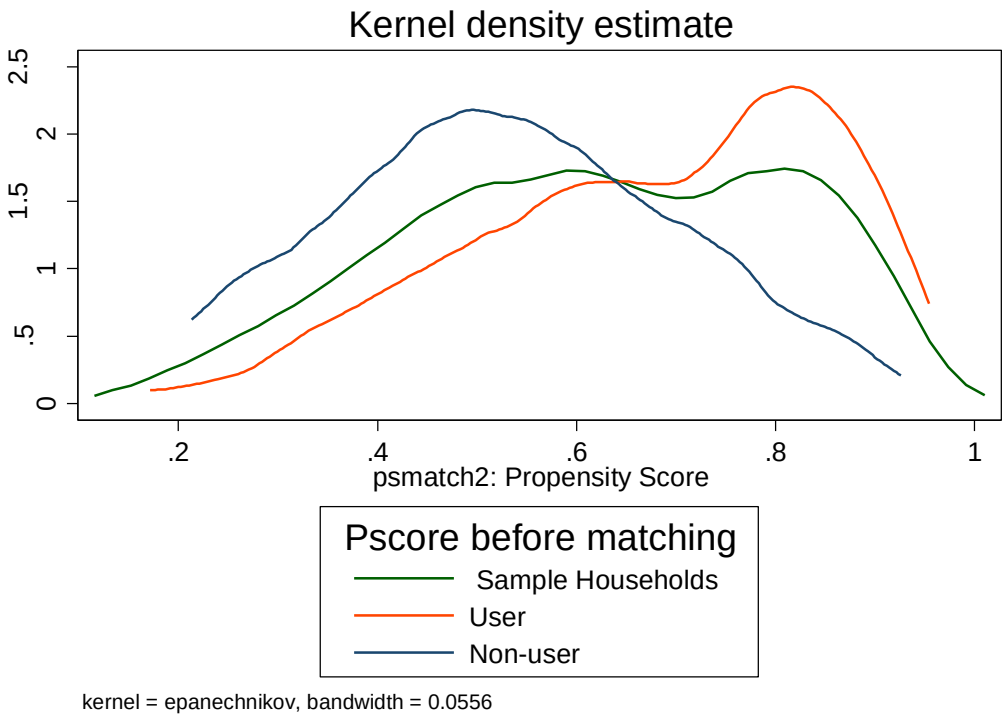



**Figure 4. Kernel density of propensity score**

As can be shown from figure 4, most of the observation lays in the right middle part of the graph with the mean propensity score value of 0.61. 2 out of 157 observations below the maxima criteria are out of the common support region and hence he/she is disregarded from further consideration. The density of distribution of the propensity scores for non-participants of the project on the other hand shows that observations with the probability above the minima criterion fail to lie on the common support region. Accordingly, none of the observations from the non-participants ignored from further consideration.

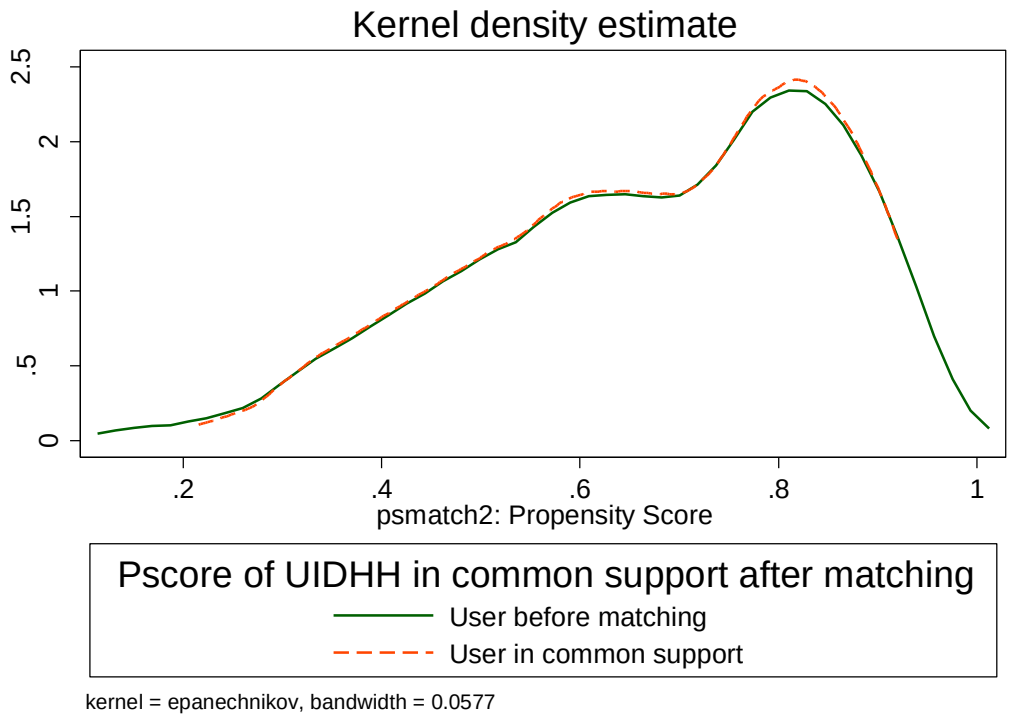



**Figure 5. Kernel density estimate of propensity scores of participants households with and without common support**

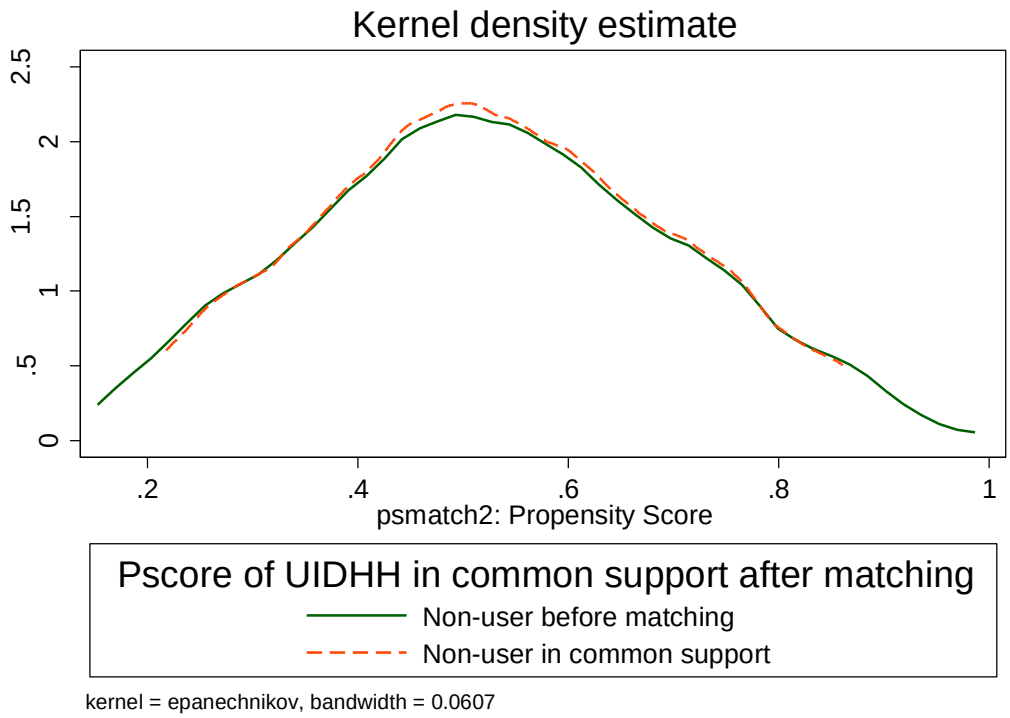



Figure 6. Kernel density estimate of propensity scores of non-participants households with and without common support

### 4.4.3 Matching of participant and non-participant households

Estimators of propensity score matching have different match quality but the choice of matching estimator is decided based on the balancing qualities of the estimators. The final choice of a matching estimator was guided by different criteria such as equal means test referred to as the balancing test (Dehejia and Wahba, 2002), pseudo-$R^2$ and matched sample size. Specifically, a matching estimator which balances all explanatory variables (i.e., results in insignificant mean differences between the two groups), bears a low $R^2$ value and also results in large matched sample size is preferable.

Here balancing test means is a test conducted to know whether there is a statistical significant difference in the mean values of covariates before and after matching. The preferred estimators are the higher the number of covariates with equal mean after matching. Keeping

other selection criterion, the balancing test indicates the quality of the matching algorithm implemented.

### 4.4.4 Selecting of best algorism

Table 4.13 Performance of matching estimators under the three criteria

| Matching Estimator | Performance criteria | | |
|---|---|---|---|
| | Balancing test* | Pseudo R2 | Matched sample size |
| Radius Caliper matching | | | |
| With 0.01 band width | 6 | 0.1169 | 135 |
| With 0.1 band width | 6 | 0.1169 | 173 |
| With 0.25 band width | 6 | 0.1169 | 180 |
| With 0.5 band width | 6 | 0.1169 | 192 |
| Kernel Matching | | | |
| With 0.01 band width | 6 | 0.1169 | 214 |
| With 0.1 band width | 6 | 0.1169 | **252** |
| With 0.25 band width | 6 | 0.1169 | **252** |
| **With 0.5 band width** | **6** | **0.1169** | **252** |
| Neighbor matching | | | |
| 1 neighbor | 6 | 0.1169 | 194 |
| 2 neighbor | 6 | 0.1169 | **252** |
| 3 neighbor | 6 | 0.1169 | **252** |
| 4 neighbor | 6 | 0.1169 | **252** |

**N.B. *** indicates that the number of non-significant variables
Source: Own estimation result

* Number of explanatory variables with no statistically significant mean differences between the matched groups of program and non-program households.

According to the criteria outlined above kernel type with band width 0.1, 0.25 and 0.5 have given similar results. As compared to other alternative matching estimators indicated in Table 4.13 they have relatively low pseudo R with best balancing test (all explanatory variables insignificant) and large matched sample size. There for matched samples either by kernel with band width of 0.1, kernel with band width of 0.25 or kernel with band width of 0.5 satisfies the property of balanced matching for all of the covariates. Accordingly, for this research the kernel matching algorism with band width of 0.5 have been used to compare PSNP participants and non-participants with respect to the impact indicators.

Table 4.14 Balancing test of matched sample

| Variable | Mean | | | | | | T-test | |
|---|---|---|---|---|---|---|---|---|
| | Food insecure | Food secure HHs | T-test | Food insecure | Food secure HHs | %bias | t | p>t |
| _pscore | 0.67399 | 0.53 | 0.4 | 0.67399 | 0.67308 | 0.5 | 0.05 | 0.963 |
| Age | 45.9682 | 44.85 | 0.94 | 45.968 | 45.478 | 3.4 | 0.31 | 0.757 |
| 1.sex | 0.7579 | 0.67 | -0.03 | 0.75796 | 0.84076 | -18.3 | -1.84 | 0.067 |
| Edu | 0.8472 | 0.83 | -0.56 | 0.84713 | 2.3057 | -68 | -3.65 | 0 |
| HHAE | 2.1940 | 2.39 | -2.27** | 2.194 | 2.1287 | 5 | 0.43 | 0.668 |
| 1.msohh | 1.1019 | 1.21 | -0.41 | 0.74522 | 0.72611 | 4.2 | 0.38 | 0.702 |
| 2.msohh | | | -1.37 | 0.17834 | 0.0828 | 23.1 | 2.53 | 0.012 |
| Agriexn | 0.8598 | 0.79 | 0.49 | 0.85987 | 0.77707 | 21.9 | 1.91 | 0.057 |
| Ownland | 1.0299 | 0.92 | 2.48** | 1.0299 | 1.0502 | -2.5 | -0.22 | 0.825 |
| Busskills | 2.1273 | 1.53 | 5.12*** | 2.1274 | 2.0637 | 6.9 | 0.57 | 0.568 |

Source: (Own estimation, 2017)

As shown Table 4.14 the balancing tests of covariates, before and after the matching. As the Table indicates, participant and non-participant households were significantly different in terms of certain pre-intervention characteristics. However, these differences were removed after the matching was conducted.

### 4.4.4 The impact of food security package loan (treatment effect)

In this section, the outcome variables are evaluated whether they have statistically significant results or not between Food Security package loan participants and non participants' households, after the pre-intervention differences were controlled. In this research 10 outcome variables was selected to analysis the impact of Food security package loan on Food insecure households who participate in the credit market or not. Each outcome variables would be analysis in different on the income of Food insecure HHs and Food secure HHs.

Table 4.15 Impact of Food Security package loan on Food insecure Households' Total Annual Income

| **Outcome variable** | Food insecure HHs | Food secure HHs | **Difference** | **S.E.** | **T-stat** |
|---|---|---|---|---|---|
| On farm income | 15228.01 | 6385.23 | 8842.78 | 845.117489 | 10.46*** |
| Off farm income | 3320.61 | 1534.24 | 1786.37 | 613.313856 | 2.91*** |
| Total Annual income | 18548.62 | 7919.47 | 10629.15 | | |

Source: Own estimation, 2017

The sources of annual income for the sampled households come from both on-farm and off-farm activities. On-farm income consists of both incomes from sales of livestock and livestock products and from sales of crops and vegetable products. Off-farm income sources are mainly from animal trade, petty trade, weaving and local beer. As presented in the above table 4.15 the annual income of the food insecure household is the sum of both the on farm and off farm incomes. The Food insecure HHs was gained greater income both on farm and off farm packages. The total annual income of the Food insecure HHs from the on farm and off farm activities gained was greater than the Food secure HHs by 10629.15 birr. This is due to the Food insecure HHs was lead by their business plans and implement accordingly. Whereas the Food insecure HHs has been implemented their agricultural activities traditionally or limited to implemented based on the business plan due to shortage of initial capital. As showed in the chi-square the Food insecure HHs and Food secure HHs were statistically significance at 1% significance level

4.16 Impact of Food Security package loan on Food insecure Households' Food and Non food consumption

| Outcome variable | Food insecure HHs | Food secure HHs | Difference | S.E. | T-stat |
|---|---|---|---|---|---|
| Food consumption (birr) | 15507.47 | 13069.53 | 2437.94 | 1636.81 | 1.49 |
| Non-food consumption (birr) | 3938.44 | 5760.60 | -1822.16 | 921.09 | -1.98* |

Source: Own estimation, 2017

The Annual food consumption of the Food insecure HHs and Food insecure households was the staple cereal crops that the households' allocated for food consumption purpose was taken in the

sampled households. Based on the survey conducted, there was not indentified impact on expenditure for food consumption purpose between the Food insecure HHs and Food secure HHs. Both the Food insecure HHs and Food secure HHs to do their day to day activities, they must be expense on food items and consumed themselves. That is way there was no statistically significance. The Annual non-food consumption of the Food insecure HHs and Food insecure HHs food insecure households was expense that include clothes, shoes, social expenses, medical expenses and others expense for the household members that was taken from the survey households.' Based on the survey conducted, there was indentified impact on expenditure for non-food consumption purpose between the Food insecure HHs and Food secure HHs. The Food secure HHs was expense non- food consumption greater than the treated groups. This non-food expense affected the Food secure HHs annual income negatively. There was statistical significance between the Food insecure HHs and Food secure HHs in terms of no food consumption.

Table 4.17 Impact of Food Security package loan on Food insecure Households' Animal Holding and Farm Land Rented

| Outcome variable | Food insecure HHs | Food secure HHs | Difference | S.E. | T-stat |
|---|---|---|---|---|---|
| Animal Holding (TLU) | 2.89 | 1.94 | 0.95 | 0.23 | 4.11*** |
| Farm Land rent(ha) | 0.21 | 0.11 | 0.10 | 0.04 | 2.75** |

Source: Own estimation, 2017

The Food insecure HHs were investing their credit based on the intended business plan. Though experience they diversify their investment opportunities and part of his profit plus credit allocated to other income generating activities. More or less based on this perspective they were used their credit effectively and efficiently. Some of the diversifying their income generating activities were rented farming land, buying livestock/ cattle and shoats/ for rearing and fatting purpose. Based on this they diversify their annual income and accumulated assets.

As presented in table 4.17 the Food insecure HHs 2.89 holds animal in average per household whereas the Food secure HHs were 1.94 holds animal in average. As showed in the T-Value this was statistically significance at 1%. As showed in table 4.20 the Food insecure HHs also rented a farming land to earn additional income than the livestock sector. The Food insecure HHs was

rented 0.21 ha farming land in average whereas the Food secure HHs rented 0.11 ha farming land in average. As showed in the T-Value this was statistically significance at 5%.

Table 4.18 Impact of Food Security package loan on Food insecure Households' on engagement on Income generating activities and saving

| **Variable** | **Attribute** | Food insecure HHs | | Food secure HHs | | **Total** | | **Chi-square** |
|---|---|---|---|---|---|---|---|---|
| | | **N** | **%** | **N** | **%** | **N** | **%** | |
| HH ENGE | not engaged on income | 19 | 12.10 | 72 | 74.23 | 91 | 35.83 | 100.64*** |
| | engaged on income activities | 138 | 87.90 | 25 | 25.77 | 163 | 64.17 | |
| | Total | 157 | 100.00 | 97 | 100.00 | 254 | 100.00 | |
| Outcome variable | Treated | Controls | Difference | S.E. | T-stat | | | |
| Saving (birr) | 348.65 | 157.35 | 191.29 | 47.94 | 3.99*** | | | |

Source: Own survey data, 2017

The Food insecure HHs has been taken a loan for the purpose of trade (32.3%), crop production (28.9%), shoat rearing (20.4%) and local food processing (32.3%) packages to diversify their income sources (Bamlak A., 2006). The main purpose of food security package loan was to engage the food insecure households in productive asset creation. Productive asset mean that a tangible thing which can be used in productive way, either self producing asset like animals and crops, or to produce something of value includes land, labor force and rental house (FSP PIM, 2010). As presented in the above table 87.90 % of the Food insecure HHs participated on income generating activities and diversify their income sources but only 12.10% of the Food insecure HHs used their credit on the unintended purposes. On the contrast 74.23% and 25.77% of the Food secure HHs were participated on income generating activities and unintended purposes. As indicated in the chi-square there was statistical difference between the Food insecure HHs and Food secure HHs.

As illustrated in the above table the Food insecure HHs save higher money (348.65birr) than the Food insecure HHs money saved (157.35).

Table 4.19 Impact of Food Security package loan on Food insecure Households' on type of House own

| Variable | Attribute | Food insecure HHs | | Food secure HHs | | Total | | Chi-square |
|---|---|---|---|---|---|---|---|---|
| | | N | % | N | % | N | % | |
| HH House | grass roof | 103 | 65.61 | 64 | 65.98 | 167 | 65.75 | 0.0037 |
| | Iron corrugated | 54 | 34.39 | 33 | 34.02 | 87 | 34.25 | |
| | Total | 157 | 100.00 | 97 | 100.00 | 254 | 100.00 | |

Source: Own survey data, 2017

Table 4.19 presented in the above table the type of housing characteristics owned among the Food insecure HHs and Food secure HHs. Compared to Food secure HHs, 34.39% Food insecure HHs household had hold Iron corrugated houses and it is similar 34.02% for Food secure HHs were owned iron corrugated houses. In case of grass roof types of houses 65.61% and 65.98% the Food insecure HHs and Food secure HHs were owned respectively. The result shows that statistically there were no significance differences in terms of types of the HHs owned house.

Table 4.20 Impact of Food Security package loan on Food insecure Households' on sending of their child to formal education

| Outcome variable | Food insecure HHs | Food secure HHs | Difference | S.E. | T-stat |
|---|---|---|---|---|---|
| Sending children(Number) | 1.32 | 0.99 | 0.33 | 0.16 | 2.00** |

Source: Own survey data, 2017

As illustrated in the above table the Food insecure HHs on average 1.32 children send to school to learn whereas the Food insecure HHs send children only 0.99 on average. The t-test showed that there was statistical difference between the Food insecure HHs and Food insecure HHs.

Table 4.21 Impact of food security package loan on income of the food in secured household

| Outcome variable | Food insecure HHs | Food secure HHs | Difference | S.E. | T-stat |
|---|---|---|---|---|---|
| On farm income | 150228.0161 | 6385.22639 | 8842.78974 | 845.117489 | 10.46*** |
| Off farm income | 3320.6129 | 1534.24162 | 1786.37128 | 613.313856 | 2.91*** |
| Food consumption (birr) | 15507.47 | 13069.53 | 2437.94 | 1636.81 | 1.49 |
| Non-food consumption (birr) | 3938.44 | 5760.60 | -1822.16 | 921.09 | -1.98* |
| Animal holding TLU | 2.89 | 1.94 | 0.95 | 0.23 | 4.11*** |
| Farm Land rent(ha) | 0.21 | 0.11 | 0.10 | 0.04 | 2.75** |
| HH engagement IGA | 0.88 | 0.26 | 0.62 | 0.05 | 11.48*** |
| Saving (birr) | 348.65 | 157.35 | 191.29 | 47.94 | 3.99*** |
| HH House | 0.35 | 0.36 | -0.01 | 0.06 | -0.11 |
| Sending children(Number) | 1.32 | 0.99 | 0.33 | 0.16 | 2.00** |

Source: Own estimation, 2017

***, **,* Significance level at 1%, 5%, and 10%

According to Chambers (1991) and Conway (1992), a livelihood comprises people, their capabilities and their means of living, including food, income and assets. The food insecure household's has been working on to improve the livelihood status of food insecure farm households. Livelihood status improvement of food security package loan users' can be explained by using variables like on farm income, off-farm income, expenditure on food consumption and non food consumption, livestock holding in (TLU), in rented farming land(Ha), engagement on income generating activities, saving part of their income, types of their houses standard and number of children attending formal education.

The statistical evidence presented in Table 4.21 revealed that there is a significant difference on Food insecure HHs and Food secure HHs in the on farm income, off farm income, Animal holding(TLU), Saving in birr, engagement in business activities, land rented in ha and sending of the children to formal education. The analysis has proved that, Food insecure HHs were better-

off than the Food secure HHs in on-farm and off farm income by running of on farm and off farm packages by about 8842.78 birr and 1786.78 respectively. This is due to the Food insecure HHs was more exposed to participate in business activities by thinking to repay their credits. The result also showed Food insecure HHs farm households cultivated in rented land has increased by 0.1 ha. Improvement in income has direct effect on saving of money on financial institutions as a result the saving amount of money of the Food insecure HHs were higher than Food secure HHs by an average amount of birr 191.29 during the study period. The animal holding (TLU) of the Food insecure HHs were greater than the Food secure HHs by 0.95 TLU. This is due to most of the Food insecure HHs were participates on the on farm activities particularly rearing and fatting of livestock's to increase and diversify their income. Due to this the animals holding of Food insecure HHs was greater than the Food secure HHs. In case of sending their child's to formal education the Food insecure HHs were greater than the Food secure HHs by 0.33 in number. This is due to the more exposed to business activities and social services forced to learnt his child to formal education.

The outcomes variables of food consumption and types of houses were statistically insignificance. Even if the consumption of Food secure HHs was slightly greater than the Food insecure HHs by 2437.94 birr there was no statistical difference between the Food insecure HHs and Food secure HHs in terms of food consumption expenditure. Both the Food insecure HHs and Food secure HHs similar types of staple cereals that were sorghum, wheat and barley and cash crops such as chicken pea and beans.

In contrast the non food consumption outcome variable was statistical difference between the Food insecure HHs and Food secure HHs. The non food consumption of Food insecure HHs was lower than the Food insecure HHs by birr of 1822.16. Both the Food secure HHs and Food insecure HHs of non food consumption expenditures were on clothes, shoes, social expenses, medical expenses and others expense for the household members according to the survey households.

### 4.4.5 The sensitivity analysis of Food Security Package loan

Table 4.22 Result of sensitivity analysis using Rosenbaum bounding approach

| No. | Outcomes | $e^{y}$=1 | $e^{y}$=1.25 | $e^{y}$=1.5 | $e^{y}$=1.75 | $e^{y}$=2 |
|---|---|---|---|---|---|---|
| 1 | On farm income | P<0.000 | P<0.000 | 0.000 | 0.000 | 0.000 |
| 2 | Off farm income | P<0.000 | P<0.000 | 0.000 | 0.000 | 0.000 |
| 3 | Non –food consumption | P<0.000 | P<0.000 | 0.000 | 0.000 | 0.000 |
| 4 | Animal holding in TLU | P<0.000 | P<0.000 | 0.000 | 0.000 | 0.000 |
| 5 | Saving money in birr | P<0.000 | P<0.000 | 0.000 | 0.000 | 1.1e-16 |
| 6 | Rented land in ha | P<0.000 | P<0.2.2e-16 | 7.0e-14 | 3.7e-12 | 7.5e-11 |
| 7 | Child education | P<0.000 | P<0.000 | 0.000 | 0.000 | 0.000 |

Source: Own estimation, 2017

$e^{y}$(Gamma) =log odds of differential due to unobserved factors where Wilcoxon significance level for each significant outcome variable is calculated

Table 4.22 presents the critical level of $e^{y}$ (first row), at which the causal inference of significant food security package loan impact has to be questioned. As noted by Hujer *et al.* (2004), sensitivity analysis for insignificant effects is not meaningful and is therefore not considered here. Given that the estimated food security package loan effect is positive for the significant outcomes, the lower bounds under the assumption that the true treatment effect has been under estimated were less interesting (Becker and Caliendo, 2007) and therefore not reported in this study. Rosenbaum bounds were calculated for food security package loan impacts that are positive and significantly different from zero. The first column of the table shows those outcome variables which bears statistical difference between treated and control households in our impact estimate above. The rest of the values which corresponds to each row of the significant outcome variables are p critical values (or the upper bound of Wilcoxon significance level -Sig+) at different critical value $e^{y}$. Result show that the inference for the impact of the food security package loan interventions is not changing though the participants and non participant households has been allowed to differ in their odds of being treated up to 100% ($e^{y}$ = 2**)** in terms

of unobserved covariates**.** That means for ball outcome variables estimated, at various level of critical value of $e^{y}$, the p- critical values are significant which further indicate that we have considered important covariates that affected both participation and outcome variables. We couldn't get the critical value $e^{y}$ where the estimated ATT is questioned, which is similar value compared to the value set in different literatures which is usually 2 (100%).Thus, we can conclude that our impact estimates (ATT) are insensitive to unobserved selection bias and are a pure impact of food security package loan interventions programs.

# CHAPTER FIVE

## 5. Conclusion and Recommendation

### 5.1 Conclusion

Ethiopian economy is dominated by subsistence agriculture. Agricultural sector Accounts for 46 percent of the GDP, 80-90 percent the export revenues and employs over 85 percent of the population. The yearly growth of food production in the country could not exceed1percent for several years while the average population growth rate is nearly 2.4 percent. As a result, chronic food shortage and drought induced famines have been common phenomena in the country. However, poverty is still pervasive with 29 percent of the population estimated to living in below the poverty line.

Small farmers in Ethiopia, as in many developing countries, lack finance to purchase productive agricultural inputs. With the exception of family labors and local seeds, almost all inputs required in agricultural production are to be purchased. However, the majority of Ethiopian population comprises small farmers, who cannot adopt a technology without external funding.

As a result efforts are being made by the federal and regional governments to provide comprehensive financial services, through microfinance, cooperatives and NGOs to solve the smallholders' problem; such as lack of factors of production (i.e., improved seeds, fertilizer, farm tools and credit for different activities such as purchase of dairy cows, oxen for fattening, sheep& goats and petty trade).This is with the assumption that smallholders should utilize the borrowed money for the intended purpose and repay their debt in time.

Therefore, the objective of this study was to investigate the impact of Food security package loan on food insecure households' income in the study area. To address the objectives of the study, relevant and related studies were reviewed. The primary data, on which the study mainly depends, was collected from a sample of 245 household heads drawn from 19 food insecure kebeles. A structured survey questionnaire was employed to interview the selected sample

household heads. Secondary data also gathered from annual reports of woreda Agricaltural office, ACSI Food Security coordination office.

In the study the Propensity Score Matching model was used to analyze the impact of food security package loan on food insecure households' income. In addition to the econometric model, descriptive statistics were also used. The descriptive analysis showed that from a total of 254 respondents, 184 of them are male and 70 are females. Based on the surveyed data, 42.68 %, 56.69 %, 0.64% of the credit users were applied to get credit in the 2nd quarter, 3rd quarter and 4th quarter respectively. Whereas the non-credit users 96.9 %, 1.03%, 2.03% and 0 % were never applied, 2nd quarter, 3rd quarter and 4th quarter respectively. Out of these users and non users only 11.46%, 73%, 66% of the food insecure households' receive credit 2nd quarter, 3rd quarter and 4th quarter respectively. As indicated in the research thesis, credits which were disbursed to the user during the 2nd and 3rd quarters were said to be on time and would contribute income increasing of the credit users.' This due to all raw materials for different income generating activities at rural community level is available and relatively cheap during these quarters. Whereas during 4th quarter all raw materials for different income generating activities at rural community level is scarce and relatively expensive during this quarter and partly it would affect negatively the credit users annual income. As analyzed in this research 42.04% of the credit users have been received their credits lately and would affect their annual income negatively.

Concerning the econometric result, ten explanatory variables had hypothesized to analyze the impact of food security package loan on households' income. The logit regression model showed that eight variables were significant effects to incomes of households. From these, seven variables were significantly positive effect to households' income. These variables are on farm and off farm annual income, animal holding in TLU, saving, rented farming land, sending children to formal education and self employment. The remaining one variable, non-food consumption affects the households' income negatively.

On farm and off farm sources of income were found significant at 1%, have positive and strong impact on the annual income of sample households. The justification for this could be credit users participate on different income generating activities using the credit more than the non-

user. In turn they earn more profits from the on farm and off farm activities which growth their annual income than non-users.

Animal holding in TLU and rented farming land in ha variables are significance at 1% and 5% respectively. Credit users were rational how to use their credits to get more revenue from their investments. They invest either in livestock or on crop production. Crop production needs a farming land. In order to gain more profits households rented farming land and produce more staple and cash crops. These in turn increase the income of households positively.

The other variables self employment, saving and sending children to formal education has positive significance effect on household income. As households engaged on different income generating activities, she/he creates self employment and gained some amount of money. This encourages the household to save some amount of his money to invest in the future or smoothing his food consumption level.

Non-food consumption was found to have significant but related negatively to the annual income of households. Allocations of income to non-food consumption have not return in the short or long term. This would be affects the income of households negatively.

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In general, the model output shows that the food security package loan has positive impact on food insecure households' income. Therefore, the program should have to be give emphasis by integrated Governmental concerned bodies, food security office and private sectors.

## 5.2 Recommendation

Based on the findings of the study the following are recommended:

- The significant impact of Food security package loan on food insecure households' income and asset accumulation in saving and TLU showed more positive signal of importance which can be geared towards improving self employment opportunities. Furthermore, the savings' of household clients increases along with the period of attachment of the clients to the financial institutions. Therefore, this trend of saving behavior should continue so that clients would be able to expand their business.
- Saving had positive and statistically significant effect on food insecure households to access food security package loan. In order to make non-credit user access to credit, financial institutions should have awareness creation, consult program and provide productive loan and follow up their credit utilization so that they can use it to generate additional income and this in turn motivates food insecure households to take credit from financial institutions.
- Close supervision and continuous follow up before and after credit disbursement brings its own positive impact and to repay credit and access credit on time. Therefore, the Agricultural extension and food security desk with concerned bodies should play key role in providing the technical capacity of the development agents and food insecure households so as to make regular supervisions.

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# 6 Appendix

Multicollinarity test for continuous variable

Table 6.1 Multicollinarity test for continuous variable

| Variable | VIF | 1/VIF |
|---|---|---|
| HHAE | 11.25 | 0.088899 |
| Hhfs | 11.19 | 0.089332 |
| ownland | 1.5 | 0.666088 |
| Age | 1.27 | 0.786261 |
| Edu | 1.08 | 0.921771 |
| Mean VIF | 5.26 | |

Multicollinarity test for categorical variable = sex and msohh

Table 6.2 Multicollinarity test for categorical variable

| | sex | msohh | agriexn | Business skills |
|---|---|---|---|---|
| Sex | 1 | | | |
| Msohh | -0.3989 | 1 | | |
| P-Value | 0.000 | | | |
| Agriexn | -0.0136 | -0.0203 | 1 | |
| P-Value | 0.8288 | 0.748 | | |
| Busskills | -0.0393 | 0.0285 | 0.1557 | 1 |
| P-Value | 0.533 | 0.6514 | 0.013 | |

Heteoskedacity test

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity

Ho: Constant variance

Variables: fitted values of pofscm

chi2(1) = 7.48
Prob > chi2 = 0.0063

N.b. The data has showed that there is heteroskedasticity problem. To solve the problem robust analysis was used.

Table 6.3 Continuous variable= Age, Edu, HHFS, On FMINCM, OFFMINCM, FRLND, SVMNY, Sending children to formal Education, Animal Holding in TLU, Food consumption, Non food consumption and Labor force in AE

| | Treated groups | | | | Controlled groups | | | | Total | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Varaible | Mean | Std Dv | Min | Max | Mean | Std Dv | Min | Max | Mean | Std Dv | Min | Max | T-Value |
| Age | 45.97 | 14.87 | 20 | 86 | 44.86 | 14.01 | 20 | 90 | 45.54 | 14.53 | 20 | 90 | -0.59 |
| Education | 0.85 | 2.25 | 0 | 10 | 0.84 | 2.03 | 0 | 12 | 0.84 | 2.17 | 0 | 12 | -0.04 |
| FamilySize | 3.71 | 1.79 | 1 | 9 | 4.07 | 1.40 | 1 | 7 | 3.8 | 1.7 | 1 | 9 | 1.71* |
| Labor force in AE | 2.19 | 1.47 | 0.75 | 6.8 | 2.39 | 1.12 | 0.75 | 5.6 | 2.27 | 1.35 | 0 | 6.8 | 1.14 |
| On farm Income | 15108.74 | 8093.97 | 0 | 41800 | 6190.39 | 5100.36 | 0 | 26733 | 11702.92 | 8313.53 | 0 | 41800 | -9.72*** |
| Off Farm Incm | 3316.53 | 6511.45 | 0 | 52200 | 1330.57 | 2975.04 | 0 | 15000 | 2558.11 | 5516.915 | 0 | 52200 | -2.82*** |
| Frmlnd | 1.23535 | 0.781369 | 0 | 3.5 | 1.03 | 0.75 | 0 | 3 | 1.160236 | 0.776571 | 0 | 3.5 | -1.97** |
| Saving | 356.9427 | 432.2061 | 0 | 2000 | 166.49 | 325.71 | 0 | 2500 | 284.2126 | 405.0111 | 0 | 2500 | -3.73*** |
| Child Schooling | 1.312102 | 1.431574 | 0 | 5 | 1.06 | 1.106 | 0 | 4 | 1.216535 | 1.320394 | 0 | 5 | -1.4 |
| Animal holding (TLU) | 2.902548 | 2.010493 | 0 | 11.92 | 1.86 | 1.57 | 0 | 7.65 | 2.507244 | 1.921438 | 0 | 11.92 | -4.31*** |
| Food Cons | 15457.06 | 18470.44 | 3100 | 228000 | 12764.76 | 6324.02 | 3000 | 33472 | 14428.9 | 15074.84 | 3000 | 228000 | -1.38 |
| Non Food | 4031.42 | 3283.832 | 0 | 16660 | 6239.87 | 8331.411 | 0 | 81000 | 4874.805 | 5843.225 | 0 | 81000 | 2.97** |

Source (own estimation,2017)

NB ***, **, * is significance level at 1%, 5% and 10% respectively

Table 6.4 Categorical= Sex, RHH, MSOHH, Access to credit, Business skill , FSINCM, HHENGN, HH House, RSTINCS, Package, REQ, RECEQ, participation in financial institution

| **Variable** | **Attribute** | **Treated groups** | **Controlled groups** | **Total** | **Chi-** |
|---|---|---|---|---|---|

| | | N | % | N | % | N | % | square |
|---|---|---|---|---|---|---|---|---|
| Sex | Female | 38 | 24.20 | 32 | 32.99 | 70 | 27.56 | 2.31 |
| | Male | 119 | 75.80 | 65 | 67.01 | 184 | 72.44 | |
| | Total | 157 | 100.00 | 97 | 100.00 | 254 | 100.00 | |
| Religion | Orthodox | 157 | 100.00 | 97 | 100.00 | 254 | 100.00 | |
| Martial | Single | 12 | 7.64 | 5 | 5.15 | 17 | 6.69 | 2.61 |
| | Married | 117 | 74.52 | 67 | 69.07 | 184 | 72.44 | |
| | Divorced | 28 | 17.83 | 25 | 25.77 | 53 | 20.87 | |
| | Total | 157 | 100.00 | 97 | 100.00 | 254 | 100.00 | |
| FSINCM | no change on their An | 32 | 20.38 | 95 | 97.94 | 127 | 50.00 | 144.25*** |
| | changed their annual | 125 | 79.62 | 2 | 2.06 | 127 | 50.00 | |
| | Total | 157 | 100.00 | 97 | 100.00 | 254 | 100.00 | |
| HH ENGN | not engaged on income | 19 | 12.10 | 72 | 74.23 | 91 | 35.83 | 100.64*** |
| | engaged on income act | 138 | 87.90 | 25 | 25.77 | 163 | 64.17 | |
| | Total | 157 | 100.00 | 97 | 100.00 | 254 | 100.00 | |
| Participation in financial institution | not save in any financial institution | 61 | 38.85 | 51 | 52.58 | 112 | 44.09 | 6.01 |
| | saved in ACSI | 18 | 11.46 | 12 | 12.37 | 30 | 11.81 | |
| | saved in Rusaco | 70 | 44.59 | 32 | 32.99 | 102 | 40.16 | |
| | saved both in ACSI & | 4 | 2.55 | 1 | 1.03 | 5 | 1.97 | |
| | Saved in bank | 4 | 2.55 | 1 | 1.03 | 5 | 1.97 | |
| | Total | 157 | 100.00 | 97 | 100.00 | 254 | 100.00 | |
| HH House | grass roof | 103 | 65.61 | 64 | 65.98 | 167 | 65.75 | 0.0037 |
| | Corrugated | 54 | 34.39 | 33 | 34.02 | 87 | 34.25 | |
| | Total | 157 | 100.00 | 97 | 100.00 | 254 | 100.00 | |
| Reason to increase their income or not | started in new business | 28 | 17.83 | 0 | 0.00 | 28 | 11.02 | 242.41*** |
| | solved shortage of in | 57 | 36.31 | 0 | 0.00 | 57 | 22.44 | |
| | expand existing business | 41 | 26.11 | 0 | 0.00 | 41 | 16.14 | |
| | no changed at all | 31 | 19.75 | 3 | 3.09 | 34 | 13.39 | |
| | not received credit at all | 0 | 0.00 | 94 | 96.91 | 94 | 37.01 | |
| | Total | 157 | 100.0 | 97 | 100.0 | 254 | 100.0 | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | 0 | | 0 | | 0 | |
| Package | no participation | 0 | 0.00 | 94 | 96.91 | 94 | 37.01 | 241.74*** |
| | Crop | 15 | 9.55 | 0 | 0.00 | 15 | 5.91 | |
| | Dairly | 22 | 14.01 | 1 | 1.03 | 23 | 9.06 | |
| | shoat rearing | 27 | 17.20 | 0 | 0.00 | 27 | 10.63 | |
| | shoat fatting | 9 | 5.73 | 0 | 0.00 | 9 | 3.54 | |
| | ox fatting | 61 | 38.85 | 2 | 2.06 | 63 | 24.80 | |
| | animal trade | 6 | 3.82 | 0 | 0.00 | 6 | 2.36 | |
| | local beer | 8 | 5.10 | 0 | 0.00 | 8 | 3.15 | |
| | Weaving | 5 | 3.18 | 0 | 0.00 | 5 | 1.97 | |
| | Onion | 1 | 0.64 | 0 | 0.00 | 1 | 0.39 | |
| | Poultry | 1 | 0.64 | 0 | 0.00 | 1 | 0.39 | |
| | petty trade | 2 | 1.27 | 0 | 0.00 | 2 | 0.79 | |
| | Total | 157 | 100.00 | 97 | 100.00 | 254 | 100.00 | |
| REQ | never apply | 0 | 0.00 | 94 | 96.91 | 94 | 37.01 | 241.53*** |
| | second quarter | 67 | 42.68 | 1 | 1.03 | 68 | 26.77 | |
| | 3rd quarter | 89 | 56.69 | 2 | 2.06 | 91 | 35.83 | |
| | 4th quarter | 1 | 0.64 | 0 | 0.00 | 1 | 0.39 | |
| | Total | 157 | 100.00 | 97 | 100.00 | 254 | 100.00 | |
| RECEQ | never receive | 0 | 0.00 | 97 | 100.00 | 97 | 38.19 | 254*** |
| | 2nd quarter | 18 | 11.46 | 0 | 0.00 | 18 | 7.09 | |
| | 3rd quarter | 73 | 46.50 | 0 | 0.00 | 73 | 28.74 | |
| | receive lately | 66 | 42.04 | 0 | 0.00 | 66 | 25.98 | |
| | Total | 157 | 100.00 | 97 | 100.00 | 254 | 100.00 | |
| Access credit | did not receive food security package l | 0 | 0.00 | 89 | 91.75 | 89 | 35.04 | 227.64*** |
| | receive food security package loan | 129 | 82.17 | 0 | 0.00 | 129 | 50.79 | |
| | receive credit from private lenders | 28 | 17.83 | 8 | 8.25 | 36 | 14.17 | |
| | Total | 157 | 100.00 | 97 | 100.00 | 254 | 100.00 | |
| Business skill | Traditional | 2 | 1.27 | 0 | 0 | 2 | 0.79 | 33.97*** |
| | On Farm | 64 | 40.76 | 67 | 69.07 | 131 | 51.57 | |
| | Off farm | 3 | 1.91 | 9 | 9.28 | 12 | 4.72 | |
| | Both | 88 | 56.05 | 21 | 21.65 | 109 | 42.91 | |
| | Total | 157 | 100.00 | 97 | 100 | 254 | 100.00 | |

Source (own estimation, 2017)

NB ***, **, * is significance level at 1%, 5% and 10% respectively